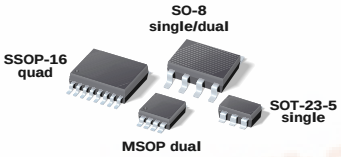
查询OPA2237供应商 捷多邦，专业PCB打样工厂，24小时加急出货

BURR-BROWN®




# OPA237
# OPA2237
# OPA4237

# SINGLE-SUPPLY OPERATIONAL AMPLIFIERS
## *MicroAmplifier*™ Series

## FEATURES

- MICRO-SIZE, MINIATURE PACKAGES
  - Single: SOT-23-5, SO-8
  - Dual: MSOP-8, SO-8
  - Quad: SSOP-16
- LOW OFFSET VOLTAGE: 750µV max
- WIDE SUPPLY RANGE
  - Single Supply: +2.7V to +36V
  - Dual Supply: ±1.35V to ±18V
- LOW QUIESCENT CURRENT: 350µA max
- WIDE BANDWIDTH: 1.5MHz

## APPLICATIONS

- BATTERY POWERED INSTRUMENTS
- PORTABLE DEVICES
- PCMCIA CARDS
- MEDICAL INSTRUMENTS
- TEST EQUIPMENT

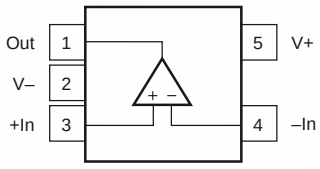
## DESCRIPTION

The OPA237 op amp family is one of Burr-Brown's *MicroAmplifier*™ series of miniature products. In addition to small size, these devices feature low offset voltage, low quiescent current, low bias current, and a wide supply range. Single, dual, and quad versions have identical specifications for maximum design flexibility. They are ideal for single supply, battery operated, and space-limited applications, such as PCMCIA cards and other portable instruments.

OPA237 series op amps can operate from either single or dual supplies. When operated from a single supply, the input common-mode range extends below ground and the output can swing to within 10mV of ground. Dual and quad designs feature completely independent circuitry for lowest crosstalk and freedom from interaction.

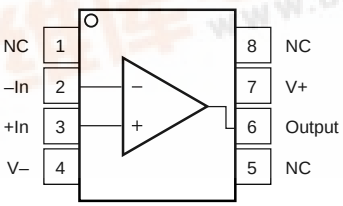
Single, dual, and quad are offered in space-saving surface-mount packages. The single version is available in the ultra-miniature 5-lead SOT-23-5 and SO-8 surface-mount. The dual version comes in a miniature MSOP-8 and SO-8 surface-mount. The quad is available in an SSOP-16. The SSOP-16 has the same body size as an SO-8 with 16 leads, while the MSOP-8 has the same lead count as a SO-8 but half the size. The SOT-23-5 is even smaller at one-fourth the size of an SO-8. All are specified for –40°C to +85°C operation. A macromodel is available for design analysis.

OPA237



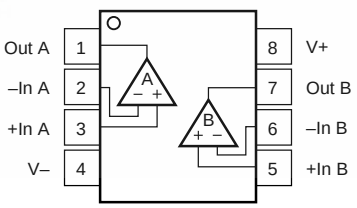

SOT-23-5

OPA237



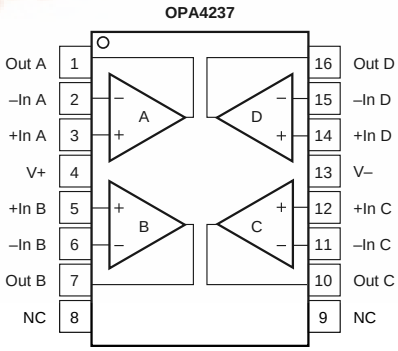

SO-8

OPA2237




SO-8, MSOP-8

OPA4237




SSOP-16

International Airport Industrial Park • Mailing Address: PO Box 11400, Tucson, AZ 85734 • Street Address: 6730 S. Tucson Blvd., Tucson, AZ 85706 • Tel: (520) 746-1111 • Twx: 910-952-1111
Internet: http://www.burr-brown.com/ • FAXLine: (800) 548-6133 (US/Canada Only) • Cable: BBRCORP • Telex: 066-6491 • FAX: (520) 889-1510 • Immediate Product Info: (800) 548-6132

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# SPECIFICATIONS: $V_S$ = +5V

At $T_A$ = +25°C, $V_S$ = +5V, $R_L$ = 10kΩ connected to $V_S$/2, unless otherwise noted.

| PARAMETER | CONDITION | OPA237UA, NA OPA2237UA, EA OPA4237UA MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|
| **OFFSET VOLTAGE** | | | | | |
| Input Offset Voltage | $V_{CM}$ = 2.5V | | ±250 | ±750 | µV |
| vs Temperature[1] | Specified Temperature Range | | ±2 | ±5 | µV/°C |
| vs Power Supply (PSRR) | $V_S$ = +2.7V to +36V | | 10 | 30 | µV/V |
| Channel Separation (dual and quad) | | | 0.5 | | µV/V |
| **INPUT BIAS CURRENT** | | | | | |
| Input Bias Current[2] | $V_{CM}$ = 2.5V | | –10 | –40 | nA |
| Input Offset Current | $V_{CM}$ = 2.5V | | ±0.5 | ±10 | nA |
| **NOISE** | | | | | |
| Input Voltage Noise, f = 0.1 to 10Hz | | | 1 | | µVp-p |
| Input Voltage Noise Density, f = 1kHz | | | 28 | | nV/√Hz |
| Current Noise Density, f = 1kHz | | | 60 | | fA/√Hz |
| **INPUT VOLTAGE RANGE** | | | | | |
| Common-Mode Voltage Range | | –0.2 | | (V+) –1.5 | V |
| Common-Mode Rejection | $V_{CM}$ = –0.2V to 3.5V | 78 | 86 | | dB |
| **INPUT IMPEDANCE** | | | | | |
| Differential | | | $5 \cdot 10^6$ \|\| 4 | | Ω \|\| pF |
| Common-Mode | | | $5 \cdot 10^9$ \|\| 2 | | Ω \|\| pF |
| **OPEN-LOOP GAIN** | | | | | |
| Open-Loop Voltage Gain | $V_O$ = 0.5V to 4V | 80 | 88 | | dB |
| **FREQUENCY RESPONSE** | | | | | |
| Gain-Bandwidth Product | | | 1.4 | | MHz |
| Slew Rate | G = 1 | | 0.5 | | V/µs |
| Settling Time: 0.1% | G = –1, 3V Step, $C_L$ = 100pF | | 11 | | µs |
| 0.01% | G = –1, 3V Step, $C_L$ = 100pF | | 16 | | µs |
| **OUTPUT** | | | | | |
| Voltage Output, Positive | $R_L$ = 100kΩ to Ground | (V+) –1 | (V+) –0.75 | | V |
| Negative | $R_L$ = 100kΩ to Ground | 0.01 | 0.001 | | V |
| Positive | $R_L$ = 100kΩ to 2.5V | (V+) –1 | (V+) –0.75 | | V |
| Negative | $R_L$ = 100kΩ to 2.5V | 0.12 | 0.04 | | V |
| Positive | $R_L$ = 10kΩ to 2.5V | (V+) –1 | (V+) –0.75 | | V |
| Negative | $R_L$ = 10kΩ to 2.5V | 0.5 | 0.35 | | V |
| Short-Circuit Current | | | –10/+4 | | mA |
| Capacitive Load Drive (stable operation) | | | See Typical Curves | | |
| **POWER SUPPLY** | | | | | |
| Specified Operating Voltage | | | +5 | | V |
| Operating Range | | +2.7 | | +36 | V |
| Quiescent Current (per amplifier) | | | 170 | 350 | µA |
| **TEMPERATURE RANGE** | | | | | |
| Specified Range | | –40 | | +85 | °C |
| Operating Range | | –55 | | +125 | °C |
| Storage | | –55 | | +125 | °C |
| Thermal Resistance, $\theta_{JA}$ | | | | | |
| 5-Lead SOT-23-5 | | | 200 | | °C/W |
| MSOP-8 Surface-Mount | | | 150 | | °C/W |
| SSOP-16 Surface-Mount | | | 150 | | °C/W |
| SO-8 Surface-Mount | | | 150 | | °C/W |

NOTES: (1) Guaranteed by wafer-level test to 95% confidence. (2) Positive conventional current flows into the input terminals.

The information provided herein is believed to be reliable; however, BURR-BROWN assumes no responsibility for inaccuracies or omissions. BURR-BROWN assumes no responsibility for the use of this information, and all use of such information shall be entirely at the user's own risk. Prices and specifications are subject to change without notice. No patent rights or licenses to any of the circuits described herein are implied or granted to any third party. BURR-BROWN does not authorize or warrant any BURR-BROWN product for use in life support devices and/or systems.

# SPECIFICATIONS: $V_S$ = +2.7V

At $T_A$ = +25°C, $V_S$ = +2.7V, $R_L$ = 10kΩ connected to $V_S$/2, unless otherwise noted.

| PARAMETER | CONDITION | OPA237UA, NA OPA2237UA, EA OPA4237UA MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|
| **OFFSET VOLTAGE** | | | | | |
| Input Offset Voltage | $V_{CM}$ = 1V | | ±250 | ±750 | µV |
| vs Temperature[1] | Specified Temperature Range | | ±2 | ±5 | µV/°C |
| vs Power Supply (PSRR) | $V_S$ = +2.7V to +36V | | 10 | 30 | µV/V |
| Channel Separation (dual and quad) | | | 0.5 | | µV/V |
| **INPUT BIAS CURRENT** | | | | | |
| Input Bias Current[2] | $V_{CM}$ = 1V | | –10 | –40 | nA |
| Input Offset Current | $V_{CM}$ = 1V | | ±0.5 | ±10 | nA |
| **NOISE** | | | | | |
| Input Voltage Noise, f = 0.1 to 10Hz | | | 1 | | µVp-p |
| Input Voltage Noise Density, f = 1kHz | | | 28 | | nV/√Hz |
| Current Noise Density, f = 1kHz | | | 60 | | fA/√Hz |
| **INPUT VOLTAGE RANGE** | | | | | |
| Common-Mode Voltage Range | | –0.2 | | (V+) –1.5 | V |
| Common-Mode Rejection | $V_{CM}$ = –0.2V to 1.2V | 75 | 85 | | dB |
| **INPUT IMPEDANCE** | | | | | |
| Differential | | | $5 \cdot 10^6$ \|\| 4 | | Ω \|\| pF |
| Common-Mode | | | $5 \cdot 10^9$ \|\| 2 | | Ω \|\| pF |
| **OPEN-LOOP GAIN** | | | | | |
| Open-Loop Voltage Gain | $V_O$ = 0.5V to 1.7V | 80 | 88 | | dB |
| **FREQUENCY RESPONSE** | | | | | |
| Gain-Bandwidth Product | | | 1.2 | | MHz |
| Slew Rate | G = 1 | | 0.5 | | V/µs |
| Settling Time: 0.1% | G = –1, 1V Step, $C_L$ = 100pF | | 5 | | µs |
| 0.01% | G = –1, 1V Step, $C_L$ = 100pF | | 8 | | µs |
| **OUTPUT** | | | | | |
| Voltage Output, Positive | $R_L$ = 100kΩ to Ground | (V+) –1 | (V+) –0.75 | | V |
| Negative | $R_L$ = 100kΩ to Ground | 0.01 | 0.001 | | V |
| Positive | $R_L$ = 100kΩ to 1.35V | (V+) –1 | (V+) –0.75 | | V |
| Negative | $R_L$ = 100kΩ to 1.35V | 0.06 | 0.02 | | V |
| Positive | $R_L$ = 10kΩ to 1.35V | (V+) –1 | (V+) –0.75 | | V |
| Negative | $R_L$ = 10kΩ to 1.35V | 0.3 | 0.2 | | V |
| Short-Circuit Current | | | –5/+3.5 | | mA |
| Capacitive Load Drive (stable operation) | | | See Typical Curves | | |
| **POWER SUPPLY** | | | | | |
| Specified Operating Voltage | | | +2.7 | | V |
| Operating Range | | +2.7 | | +36 | V |
| Quiescent Current (per amplifier) | | | 160 | 350 | µA |
| **TEMPERATURE RANGE** | | | | | |
| Specified Range | | –40 | | +85 | °C |
| Operating Range | | –55 | | +125 | °C |
| Storage | | –55 | | +125 | °C |
| Thermal Resistance, $\theta_{JA}$ | | | | | |
| 5-Lead SOT-23-5 | | | 200 | | °C/W |
| MSOP-8 Surface-Mount | | | 150 | | °C/W |
| SSOP-16 Surface-Mount | | | 150 | | °C/W |
| SO-8 Surface-Mount | | | 150 | | °C/W |

NOTES: (1) Guaranteed by wafer-level test to 95% confidence. (2) Positive conventional current flows into the input terminals.

# SPECIFICATIONS: $V_S = \pm 15V$

At $T_A$ = +25°C, $V_S$ = ±15V, $R_L$ = 10kΩ connected to $V_S/2$, unless otherwise noted.

| PARAMETER | CONDITION | OPA237UA, NA OPA2237UA, EA OPA4237UA MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|
| **OFFSET VOLTAGE** | | | | | |
| Input Offset Voltage | $V_{CM}$ = 0V | | ±350 | ±950 | µV |
| vs Temperature[1] | Specified Temperature Range | | ±2.5 | ±7 | µV/°C |
| vs Power Supply (PSRR) | $V_S$ = ±1.35V to ±18V | | 10 | 30 | µV/V |
| Channel Separation (dual and quad) | | | 0.5 | | µV/V |
| **INPUT BIAS CURRENT** | | | | | |
| Input Bias Current[2] | $V_{CM}$ = 0V | | –8.5 | –40 | nA |
| Input Offset Current | $V_{CM}$ = 0V | | ±0.5 | ±10 | nA |
| **NOISE** | | | | | |
| Input Voltage Noise, f = 0.1 to 10Hz | | | 1 | | µVp-p |
| Input Voltage Noise Density, f = 1kHz | | | 28 | | $nV/\sqrt{Hz}$ |
| Current Noise Density, f = 1kHz | | | 60 | | $fA/\sqrt{Hz}$ |
| **INPUT VOLTAGE RANGE** | | | | | |
| Common-Mode Voltage Range | | (V–) –0.2 | | (V+) –1.5 | V |
| Common-Mode Rejection | $V_{CM}$ = –15V to 13.5V | 80 | 90 | | dB |
| **INPUT IMPEDANCE** | | | | | |
| Differential | | | $5 \cdot 10^6 \parallel 4$ | | Ω \|\| pF |
| Common-Mode | | | $5 \cdot 10^9 \parallel 2$ | | Ω \|\| pF |
| **OPEN-LOOP GAIN** | | | | | |
| Open-Loop Voltage Gain | $V_O$ = –14V to 13.8V | 80 | 88 | | dB |
| **FREQUENCY RESPONSE** | | | | | |
| Gain-Bandwidth Product | | | 1.5 | | MHz |
| Slew Rate | G = 1 | | 0.5 | | V/µs |
| Settling Time: 0.1% | G = –1, 10V Step, $C_L$ = 100pF | | 18 | | µs |
| 0.01% | G = –1, 10V Step, $C_L$ = 100pF | | 21 | | µs |
| **OUTPUT** | | | | | |
| Voltage Output, Positive | $R_L$ = 100kΩ | (V+) –1.2 | (V+) –0.9 | | V |
| Negative | $R_L$ = 100kΩ | (V–) +0.5 | (V–) +0.3 | | V |
| Positive | $R_L$ = 10kΩ | (V+) –1.2 | (V+) –0.9 | | V |
| Negative | $R_L$ = 10kΩ | (V–) +1 | (V–) +0.85 | | V |
| Short-Circuit Current | | | –8/+4.5 | | mA |
| Capacitive Load Drive (stable operation) | | | See Typical Curves | | |
| **POWER SUPPLY** | | | | | |
| Specified Operating Voltage | | | ±15 | | V |
| Operating Range | | ±1.35 | | ±18 | V |
| Quiescent Current (per amplifier) | | | ±200 | ±475 | µA |
| **TEMPERATURE RANGE** | | | | | |
| Specified Range | | –40 | | +85 | °C |
| Operating Range | | –55 | | +125 | °C |
| Storage | | –55 | | +125 | °C |
| Thermal Resistance, $\theta_{JA}$ | | | | | |
| 5-Lead SOT-23-5 | | | 200 | | °C/W |
| MSOP-8 Surface-Mount | | | 150 | | °C/W |
| SSOP-16 Surface-Mount | | | 150 | | °C/W |
| SO-8 Surface-Mount | | | 150 | | °C/W |

NOTES: (1) Guaranteed by wafer-level test to 95% confidence. (2) Positive conventional current flows into the input terminals.

## ABSOLUTE MAXIMUM RATINGS

| | |
|---|---|
| Supply Voltage, V+ to V– | 36V |
| Input Voltage | (V–) –0.7V to (V+) +0.7V |
| Output Short-Circuit[1] | Continuous |
| Operating Temperature | –40°C to +125°C |
| Storage Temperature | –55°C to +125°C |
| Junction Temperature | +150°C |
| Lead Temperature (soldering, 10s) | 300°C |

NOTE: (1) Short circuit to ground, one amplifier per package.

## ELECTROSTATIC DISCHARGE SENSITIVITY

This integrated circuit can be damaged by ESD. Burr-Brown recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

## PACKAGE/ORDERING INFORMATION

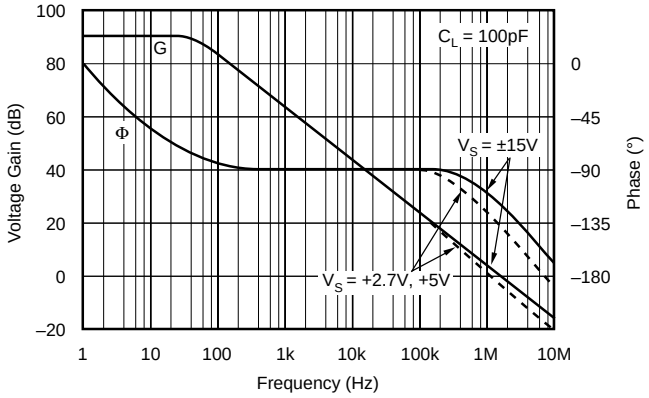
| PRODUCT | PACKAGE | PACKAGE DRAWING NUMBER[1] | TEMPERATURE RANGE | PACKAGE MARKING | ORDERING NUMBER[2] |
|---|---|---|---|---|---|
| **Single** | | | | | |
| OPA237NA | 5-Lead SOT-23-5 | 331 | –40°C to +85°C | A37A | OPA237NA-250 |
| " | " | " | " | " | OPA237NA-3K |
| OPA237UA | SO-8 Surface-Mount | 182 | –40°C to +85°C | OPA237UA | OPA237UA |
| **Dual** | | | | | |
| OPA2237EA | MSOP-8 Surface-Mount | 337 | –40°C to +85°C | B37A | OPA2237EA-250 |
| " | " | " | " | " | OPA2237EA-2500 |
| OPA2237UA | SO-8 Surface-Mount | 182 | –40°C to +85°C | OPA2237UA | OPA2237UA |
| **Quad** | | | | | |
| OPA4237UA | SSOP-16 Surface-Mount | 322 | –40°C to +85°C | OPA4237UA | OPA4237UA-250 |
| " | " | " | " | " | OPA4237UA-2500 |

NOTE: (1) For detailed drawing and dimension table, please see end of data sheet, or Appendix C of Burr-Brown IC Data Book. (2) Models with -250, -2500, and -3K are available only in Tape and Reel in the quantity indicated (e.g., -250 indicates 250 devices per reel). Ordering 3000 pieces of "OPA237NA-3K" will get a single 3000 piece Tape and Reel. SO-8 models are available in tubes or Tape and Reel. For detailed Tape and Reel mechanical information, refer to Appendix B of Burr-Brown IC Data Book.

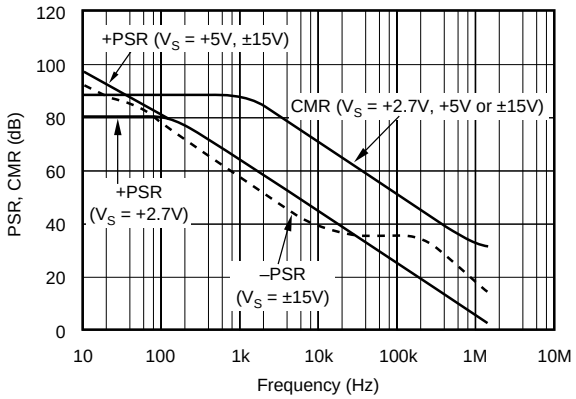
# TYPICAL PERFORMANCE CURVES

At $T_A$ = +25°C and $R_L$ = 10kΩ, unless otherwise noted.

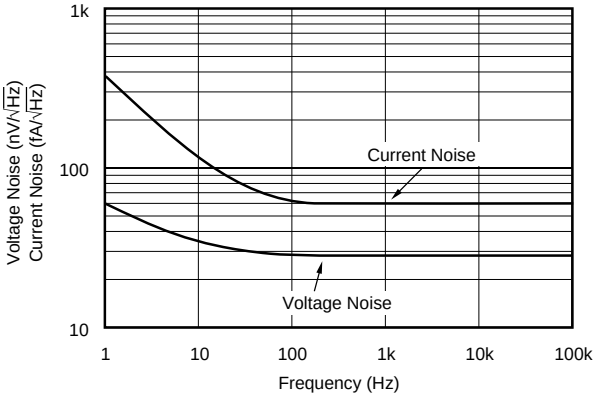
OPEN-LOOP GAIN/PHASE vs FREQUENCY



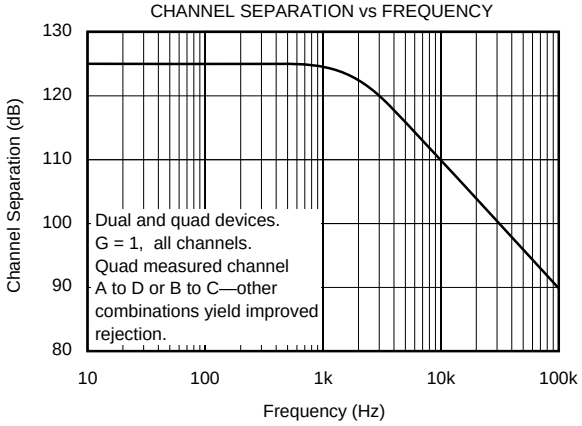

POWER SUPPLY and COMMON-MODE REJECTION vs FREQUENCY



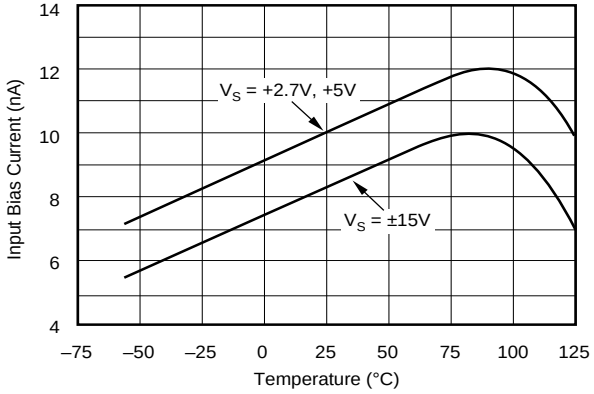

INPUT NOISE AND CURRENT NOISE SPECTRAL DENSITY vs FREQUENCY



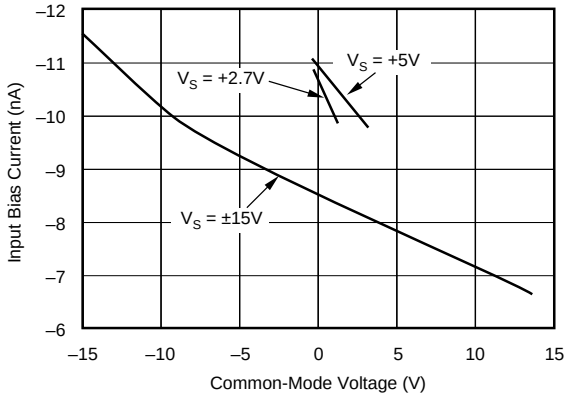

CHANNEL SEPARATION vs FREQUENCY




INPUT BIAS CURRENT vs TEMPERATURE



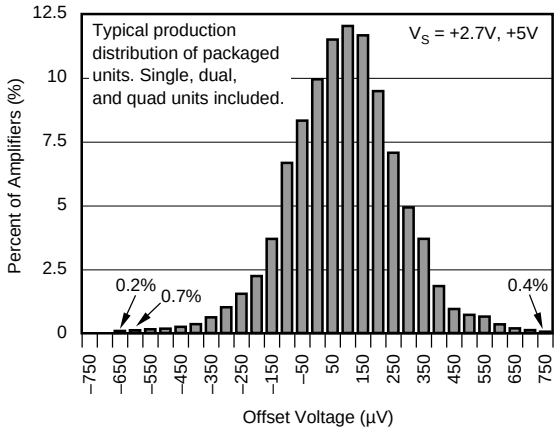

INPUT BIAS CURRENT vs INPUT COMMON-MODE VOLTAGE



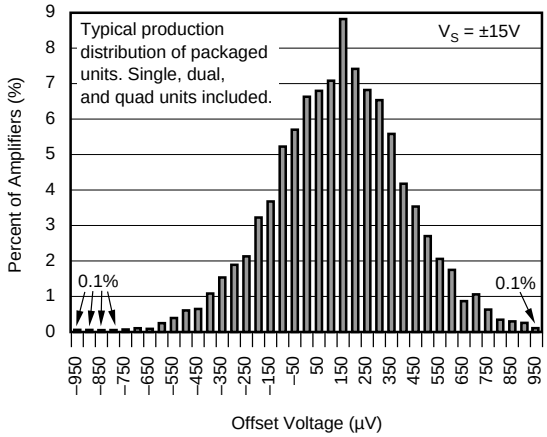
# TYPICAL PERFORMANCE CURVES (CONT)

At $T_A$ = +25°C and $R_L$ = 10kΩ, unless otherwise noted.

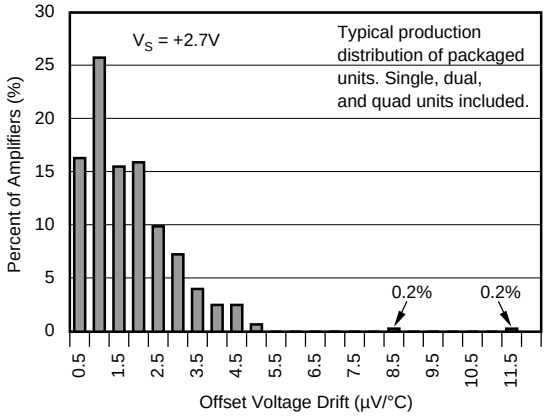
OFFSET VOLTAGE
PRODUCTION DISTRIBUTION



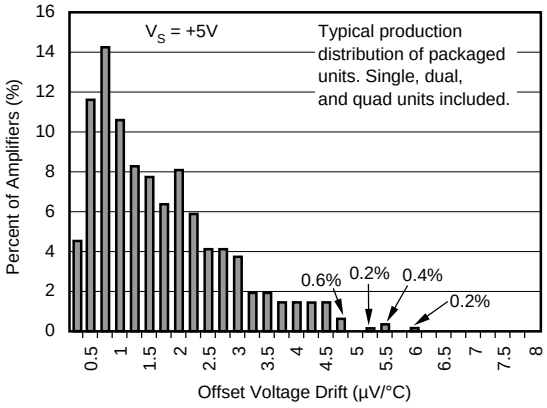

OFFSET VOLTAGE
PRODUCTION DISTRIBUTION



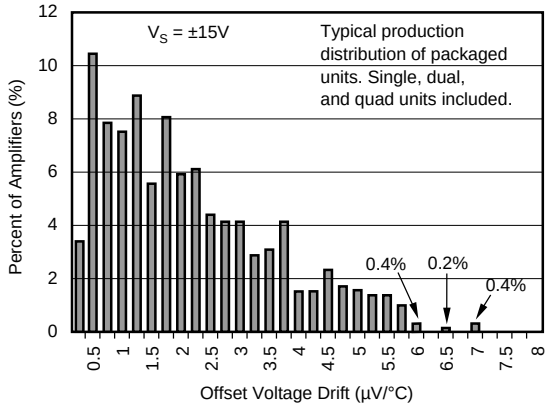

OFFSET VOLTAGE DRIFT
PRODUCTION DISTRIBUTION



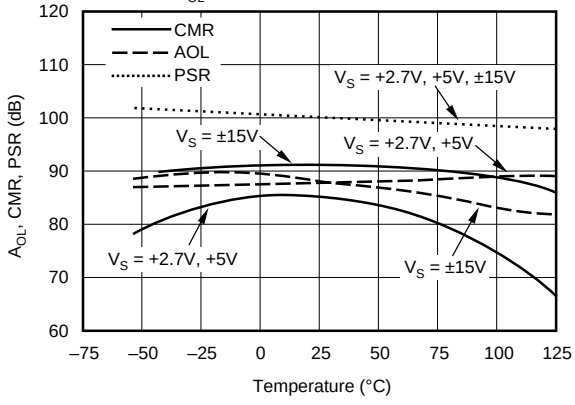

OFFSET VOLTAGE DRIFT
PRODUCTION DISTRIBUTION




OFFSET VOLTAGE DRIFT
PRODUCTION DISTRIBUTION



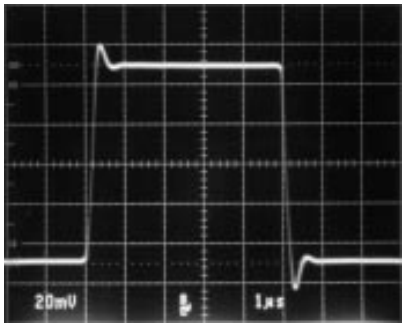

$A_{OL}$, CMR, PSR vs TEMPERATURE



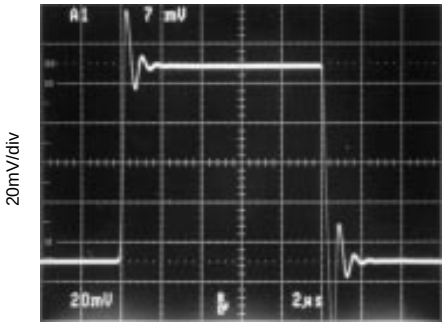
# TYPICAL PERFORMANCE CURVES (CONT)

At $T_A$ = +25°C and $R_L$ = 10kΩ, unless otherwise noted.

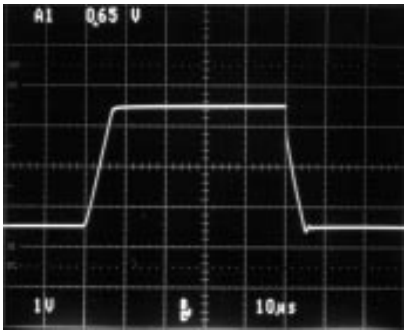
SMALL-SIGNAL STEP RESPONSE
G = 1, $C_L$ = 100pF, $V_S$ = +5V



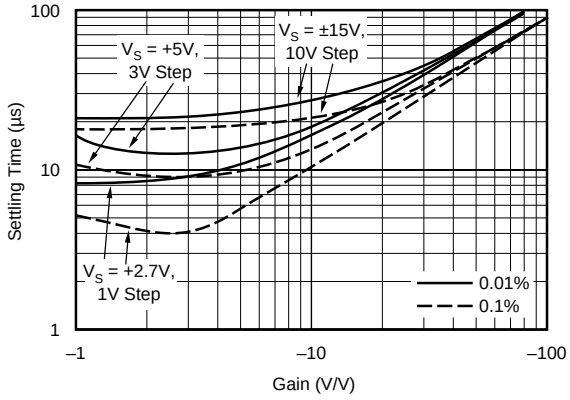

SMALL-SIGNAL STEP RESPONSE
G = 1, $C_L$ = 220pF, $V_S$ = +5V



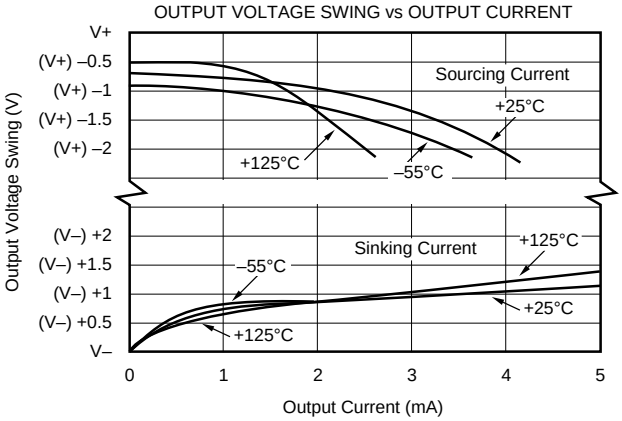

LARGE-SIGNAL STEP RESPONSE
G = 1, $C_L$ = 100pF, $V_S$ = +5V



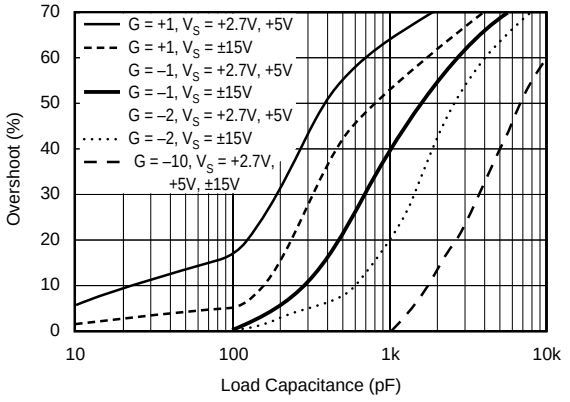

SETTLING TIME vs GAIN




OUTPUT VOLTAGE SWING vs OUTPUT CURRENT



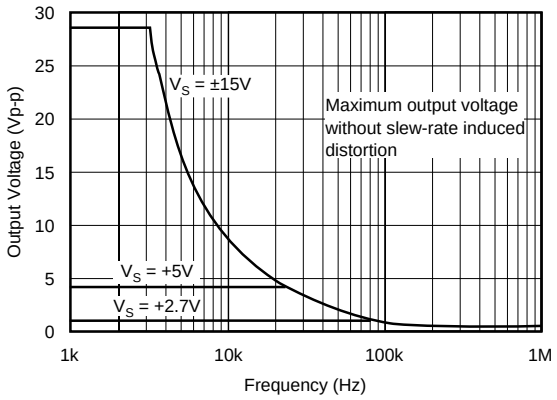

SMALL-SIGNAL OVERSHOOT
vs LOAD CAPACITANCE



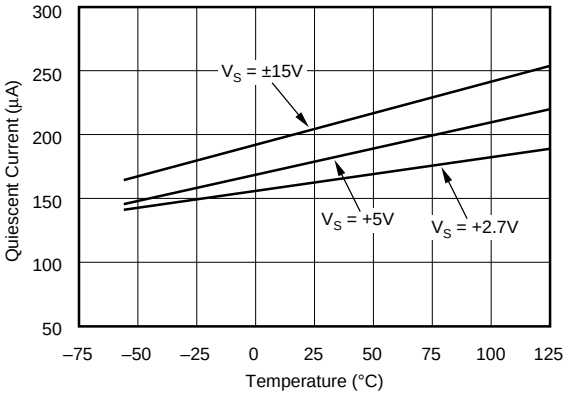
# TYPICAL PERFORMANCE CURVES (CONT)

At $T_A$ = +25°C and $R_L$ = 10kΩ, unless otherwise noted.

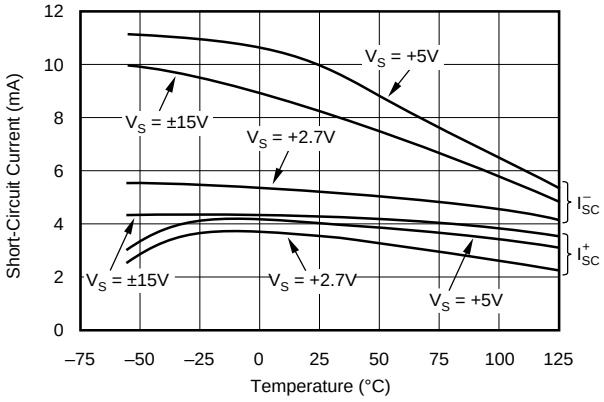
MAXIMUM OUTPUT VOLTAGE vs FREQUENCY




QUIESCENT CURRENT vs TEMPERATURE




SHORT-CIRCUIT CURRENT vs TEMPERATURE



# APPLICATIONS INFORMATION

OPA237 series op amps are unity-gain stable and suitable for a wide range of general-purpose applications. Power supply pins should be bypassed with 10nF ceramic capacitors.

## OPERATING VOLTAGE

OPA237 series op amps operate from single (+2.7V to +36V) or dual (±1.35V to ±18V) supplies with excellent performance. Most behavior remains unchanged throughout the full operating voltage range. Parameters which vary significantly with operating voltage are shown in typical performance curves. Specifications are production tested with +2.7V, +5V, and ±15V supplies.

## OUTPUT CURRENT AND STABILITY

OPA237 series op amps can drive large capacitive loads. However, under certain limited output conditions any op amp may become unstable. Figure 1 shows the region where the OPA237 has a potential for instability. These load conditions are rarely encountered, especially for single supply applications. For example, take the case when a +5V supply with a 10kΩ load to $V_S/2$ is used. OPA237 series op amps remain stable with capacitive loads up to 4,000pF, if sinking current and up to 10,000pF, if sourcing current. Furthermore, in single supply applications where the load is connected to ground, the op amp is only sourcing current, and as shown in Figure 1, can drive 10,000pF with output currents up to 1.5mA.

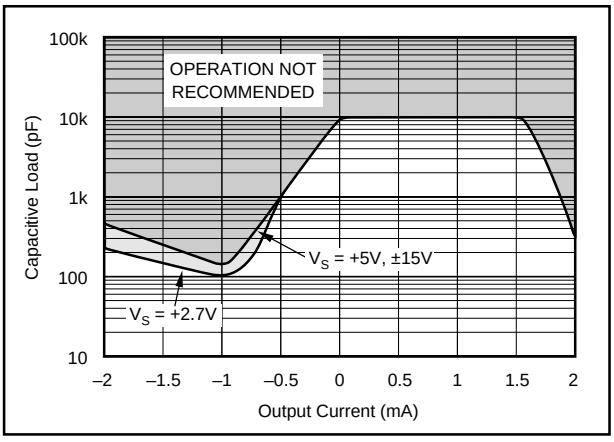



FIGURE 1. Stability-Capacitive Load vs Output Current.

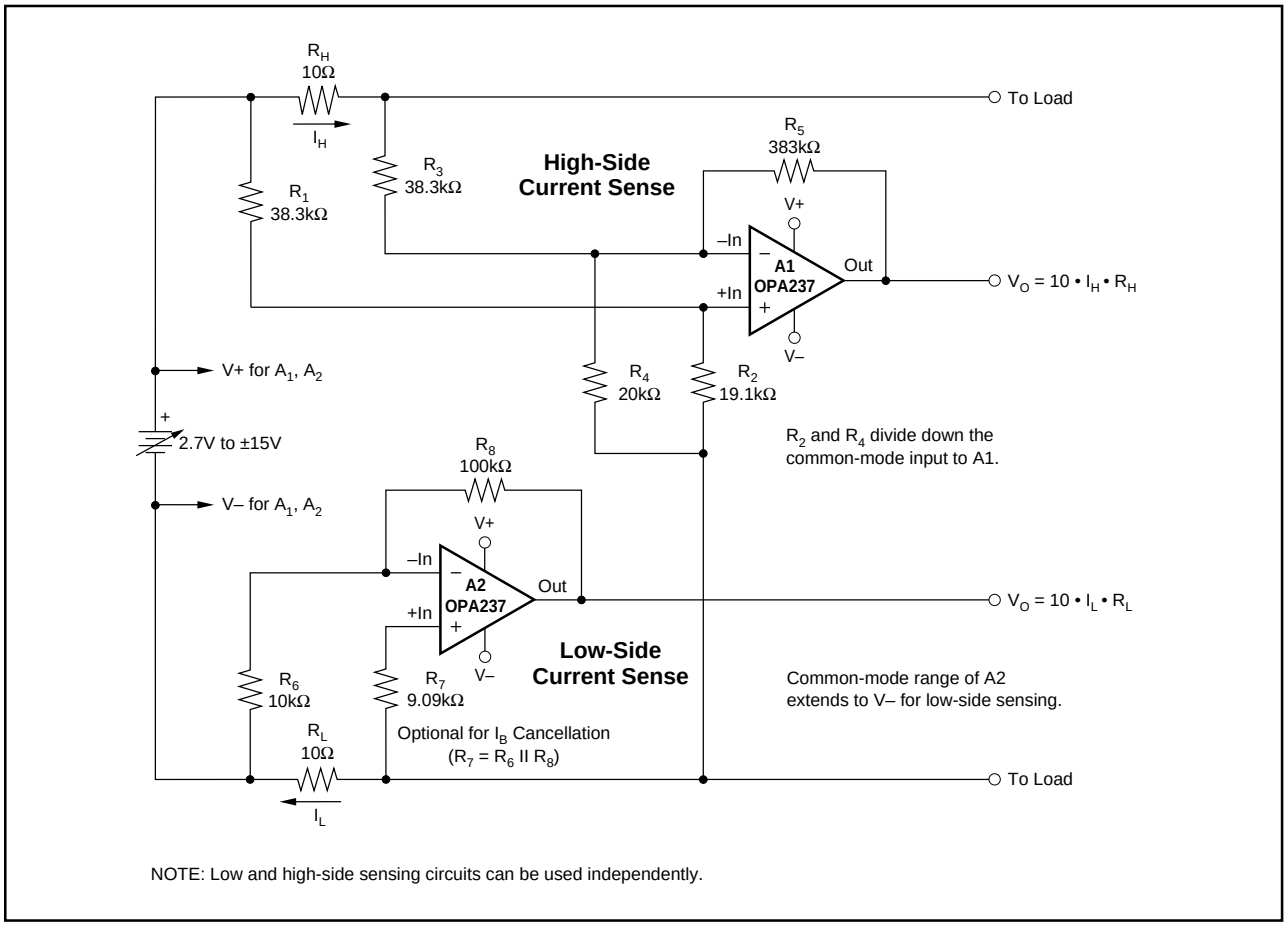



FIGURE 2. Low and High-Side Battery Current Sensing.