# Low Power, Precision, Auto-Zero Op Amps

# AD8538/AD8539

## FEATURES

**Low offset voltage: 13 µV maximum**
**Input offset drift: 0.03 µV/°C**
**Single-supply operation: 2.7 V to 5.5 V**
**High gain, CMRR, and PSRR**
**Low input bias current: 25 pA**
**Low supply current: 180 µA**

## APPLICATIONS

**Mobile communications**
**Portable instrumentation**
**Battery-powered devices**
**Sensor interfaces**
**Temperature measurement**
**Electronic scales**

## GENERAL DESCRIPTION

The AD8538/AD8539 are very high precision amplifiers featuring extremely low offset voltage, low input bias current, and low power consumption. The supply current is less than 215 µA maximujm per amplifier at 5.0 V. Operation is fully specified from 2.7 V to 5.0 V single supply (±1.35 V to ±2.5 V dual supply).

The AD8538/AD8539 operate at very low power making these amplifiers ideal for battery-powered devices and portable equipment.

The AD8538/AD8539 are specified over the extended industrial temperature range (−40°C to +125°C). The AD8538 amplifier is available in 5-lead TSOT-23, and 8-lead, narrow body SOIC packages, and the AD8539 amplifier is available in 8-lead, narrow body SOIC and 8-lead MSOP.

## PIN CONFIGURATIONS

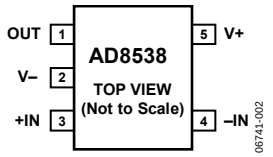


*Figure 1. 5-Lead TSOT-23 (UJ-5)*

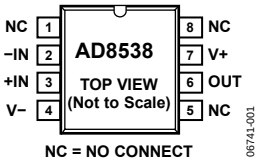


*Figure 2. 8-Lead SOIC_N (R-8)*

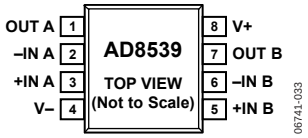


*Figure 3. 8-Lead SOIC_N (R-8)*

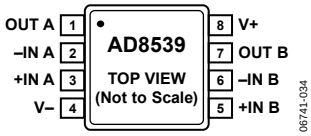


*Figure 4. 8-Lead MSOP (RM-8)*

**Rev. A**



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**10/05—Revision 0: Initial Version**

# SPECIFICATIONS

## AD8538 ELECTRICAL SPECIFICATIONS

@ $V_S$ = 5.0 V, $V_{CM}$ = 2.5 V, $V_O$ = 2.5 V, $T_A$ = 25°C, unless otherwise specified.

**Table 1.**

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| INPUT CHARACTERISTICS | | | | | | |
| Offset Voltage | $V_{OS}$ | | | 5 | 13 | µV |
| | | −40°C ≤ $T_A$ ≤ +125°C | | | 30 | µV |
| Input Bias Current | $I_B$ | | | 15 | 25 | pA |
| | | −40°C ≤ $T_A$ ≤ +85°C | | 35 | 100 | pA |
| | | −40°C ≤ $T_A$ ≤ +125°C | | 0.7 | 1.0 | nA |
| Input Offset Current | $I_{OS}$ | | | 20 | 50 | pA |
| | | −40°C ≤ $T_A$ ≤ +125°C | | | 150 | pA |
| Input Voltage Range | | | 0 | | 5 | V |
| Common-Mode Rejection Ratio | CMRR | $V_{CM}$ = 0 V to 5 V | 115 | 150 | | dB |
| | | −40°C ≤ $T_A$ ≤ +125°C, $V_{CM}$ = 0.2 V to 4.8 V | 100 | 135 | | dB |
| Large Signal Voltage Gain | $A_{VO}$ | $R_L$ = 10 kΩ, $V_O$ = 0.1 V to 4.9 V | 115 | 141 | | dB |
| | | −40°C ≤ $T_A$ ≤ +125°C | 110 | 135 | | dB |
| Offset Voltage Drift | $\Delta V_{OS}/\Delta T$ | −40°C ≤ $T_A$ ≤ +125°C | | 0.03 | 0.1 | µV/°C |
| OUTPUT CHARACTERISTICS | | | | | | |
| Output Voltage High | $V_{OH}$ | $R_L$ = 100 kΩ to ground | 4.99 | 4.998 | | V |
| | | −40°C ≤ $T_A$ ≤ +125°C, $R_L$ = 100 kΩ to ground | 4.98 | | | V |
| | | $R_L$ = 10 kΩ to ground | 4.95 | 4.970 | | V |
| | | −40°C ≤ $T_A$ ≤ +125°C, $R_L$ = 10 kΩ to ground | 4.94 | | | V |
| Output Voltage Low | $V_{OL}$ | $R_L$ = 100 kΩ to V+ | | 1.9 | 5 | mV |
| | | −40°C ≤ $T_A$ ≤ +125°C, $R_L$ = 100 kΩ to V+ | | 2.8 | 7 | mV |
| | | $R_L$ = 10 kΩ to V+ | | 17 | 20 | mV |
| | | −40°C ≤ $T_A$ ≤ +125°C, $R_L$ = 10 kΩ to V+ | | 20 | 30 | mV |
| Short-Circuit Limit | $I_{SC}$ | | | ±25 | | mA |
| POWER SUPPLY | | | | | | |
| Power Supply Rejection Ratio | PSRR | $V_S$ = 2.7 V to 5.0 V | 105 | 125 | | dB |
| | | −40°C ≤ $T_A$ ≤ +125°C | 100 | 125 | | dB |
| Supply Current/Amplifier | $I_{SY}$ | $I_O$ = 0 | | 150 | 180 | µA |
| | | −40°C ≤ $T_A$ ≤ +125°C | | 190 | 215 | µA |
| DYNAMIC PERFORMANCE | | | | | | |
| Slew Rate | SR | $R_L$ =10 kΩ | | 0.4 | | V/µs |
| Settling Time 0.01% | $t_S$ | G = ±1, 2 V step, $C_L$ = 20 pF, $R_L$ = 1 kΩ | | 10 | | µs |
| Overload Recovery Time | | | | 0.05 | | ms |
| Gain Bandwidth Product | GBP | | | 430 | | kHz |
| Phase Margin | $Ø_M$ | $R_L$ = 10 kΩ, $R_L$ = 100 kΩ, $C_L$ = 20 pF | | 65 | | Degrees |
| NOISE PERFORMANCE | | | | | | |
| Voltage Noise | $e_{n\,p\text{-}p}$ | f = 0.1 Hz to 10 Hz | | 2.0 | | µV p-p |
| Voltage Noise Density | $e_n$ | f = 1 kHz | | 50 | | nV/√Hz |

@ $V_S$ = 2.7 V, $V_{CM}$ = 1.35 V, $V_O$ = 1.35 V, $T_A$ = 25°C, unless otherwise specified.

**Table 2.**

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| INPUT CHARACTERISTICS | | | | | | |
| Offset Voltage | $V_{OS}$ | | | 5 | 13 | µV |
| | | −40°C ≤ $T_A$ ≤ +125°C | | | 30 | µV |
| Input Bias Current | $I_B$ | | | 15 | 25 | pA |
| | | −40°C ≤ $T_A$ ≤ +85°C | | 35 | 100 | pA |
| | | −40°C ≤ $T_A$ ≤ +125°C | | 0.7 | 1.0 | nA |
| Input Offset Current | $I_{OS}$ | | | 20 | 50 | pA |
| | | −40°C ≤ $T_A$ ≤ +125°C | | | 150 | pA |
| Input Voltage Range | | | 0 | | 2.7 | V |
| Common-Mode Rejection Ratio | CMRR | $V_{CM}$ = 0 V to 2.5 V | 110 | 140 | | dB |
| | | −40°C ≤ $T_A$ ≤ +125°C | 100 | 135 | | dB |
| Large Signal Voltage Gain | $A_{VO}$ | $R_L$ = 10 kΩ, $V_O$ = 0.1 V to 1.7 V | 110 | 140 | | dB |
| | | −40°C ≤ $T_A$ ≤ +125°C | 105 | 135 | | dB |
| Offset Voltage Drift | $\Delta V_{OS}/\Delta T$ | −40°C ≤ $T_A$ ≤ +125°C | | 0.03 | 0.1 | µV/°C |
| OUTPUT CHARACTERISTICS | | | | | | |
| Output Voltage High | $V_{OH}$ | $R_L$ = 100 kΩ to ground | 2.68 | 2.698 | | V |
| | | −40°C ≤ $T_A$ ≤ +125°C, $R_L$ = 100 kΩ to ground | 2.68 | | | V |
| | | $R_L$ = 10 kΩ to ground | 2.67 | 2.68 | | V |
| | | −40°C ≤ $T_A$ ≤ +125°C, $R_L$ = 10 kΩ to ground | 2.66 | | | V |
| Output Voltage Low | $V_{OL}$ | $R_L$ = 100 kΩ to V+ | | 1.7 | 5 | mV |
| | | −40°C ≤ $T_A$ ≤ +125°C, $R_L$ = 100 kΩ to V+ | | 2.4 | 5 | mV |
| | | $R_L$ = 10 kΩ to V+ | | 14 | 20 | mV |
| | | −40°C ≤ $T_A$ ≤ +125°C, $R_L$ = 10 kΩ to V+ | | 20 | 25 | mV |
| Short-Circuit Limit | $I_{SC}$ | | | ±8 | | mA |
| POWER SUPPLY | | | | | | |
| Power Supply Rejection Ratio | PSRR | $V_S$ = 2.7 V to 5.5 V | 105 | 125 | | dB |
| | | −40°C ≤ $T_A$ ≤ +125°C | 100 | 125 | | dB |
| Supply Current/Amplifier | $I_{SY}$ | $I_O$ = 0 | | 150 | 180 | µA |
| | | −40°C ≤ $T_A$ ≤ +125°C | | 190 | 215 | µA |
| DYNAMIC PERFORMANCE | | | | | | |
| Slew Rate | SR | $R_L$ = 10 kΩ | | 0.35 | | V/µs |
| Settling Time 0.01% | $t_S$ | G = ±1, 1 V step, $C_L$ = 20 pF, $R_L$ = 1 kΩ | | 5 | | µs |
| Overload Recovery Time | | | | 0.05 | | ms |
| Gain Bandwidth Product | GBP | | | 430 | | kHz |
| Phase Margin | $Ø_M$ | $R_L$ = 10 kΩ, $R_L$ = 100 kΩ, $C_L$ = 20 pF | | 65 | | Degrees |
| NOISE PERFORMANCE | | | | | | |
| Voltage Noise | $e_{n\,p\text{-}p}$ | f = 0.1 Hz to 10 Hz | | 2.0 | | µV p-p |
| Voltage Noise Density | $e_n$ | f = 1 kHz | | 50 | | nV/√Hz |

## AD8539 ELECTRICAL SPECIFICATIONS

@ $V_S$ = 5.0 V, $V_{CM}$ = 2.5 V, $V_O$ = 2.5 V, $T_A$ = 25°C, unless otherwise specified.

**Table 3.**

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| INPUT CHARACTERISTICS | | | | | | |
| Offset Voltage | $V_{OS}$ | | | 5 | 15 | µV |
| | | −40°C ≤ $T_A$ ≤ +125°C | | | 30 | µV |
| Input Bias Current | $I_B$ | | | 15 | 60 | pA |
| | | −40°C ≤ $T_A$ ≤ +85°C | | 35 | 125 | pA |
| | | −40°C ≤ $T_A$ ≤ +125°C | | 0.7 | 1.0 | nA |
| Input Offset Current | $I_{OS}$ | | | 20 | 70 | pA |
| | | −40°C ≤ $T_A$ ≤ +125°C | | | 400 | pA |
| Input Voltage Range | | | 0 | | 5 | V |
| | | −40°C ≤ $T_A$ ≤ +125°C | 0.2 | | 4.8 | V |
| Common-Mode Rejection Ratio | CMRR | $V_{CM}$ = 0 V to 5 V | 115 | 135 | | dB |
| | | −40°C ≤ $T_A$ ≤ +125°C, $V_{CM}$ = 0.2 V to 4.8 V | 100 | 130 | | dB |
| Large Signal Voltage Gain | $A_{VO}$ | $R_L$ = 10 kΩ, $V_O$ = 0.1 V to 4.9 V | 110 | 130 | | dB |
| | | −40°C ≤ $T_A$ ≤ +125°C | 110 | 125 | | dB |
| Offset Voltage Drift | $\Delta V_{OS}/\Delta T$ | −40°C ≤ $T_A$ ≤ +125°C | | 0.03 | 0.1 | µV/°C |
| OUTPUT CHARACTERISTICS | | | | | | |
| Output Voltage High | $V_{OH}$ | $R_L$ = 100 kΩ to ground | 4.99 | 4.994 | | V |
| | | −40°C ≤ $T_A$ ≤ +125°C, $R_L$ = 100 kΩ to ground | 4.98 | | | V |
| | | $R_L$ = 10 kΩ to ground | 4.95 | 4.97 | | V |
| | | −40°C ≤ $T_A$ ≤ +125°C, $R_L$ = 10 kΩ to ground | 4.94 | | | V |
| Output Voltage Low | $V_{OL}$ | $R_L$ = 100 kΩ to V+ | | 5 | 7 | mV |
| | | −40°C ≤ $T_A$ ≤ +125°C, $R_L$ = 100 kΩ to V+ | | 6 | 8 | mV |
| | | $R_L$ = 10 kΩ to V+ | | 20 | 25 | mV |
| | | −40°C ≤ $T_A$ ≤ +125°C, $R_L$ = 10 kΩ to V+ | | 24 | 30 | mV |
| Short-Circuit Limit | $I_{SC}$ | | | ±25 | | mA |
| POWER SUPPLY | | | | | | |
| Power Supply Rejection Ratio | PSRR | $V_S$ = 2.7 V to 5.0 V | 105 | 125 | | dB |
| | | −40°C ≤ $T_A$ ≤ +125°C | 100 | 125 | | dB |
| Supply Current/Amplifier | $I_{SY}$ | $I_O$ = 0 | | 170 | 210 | µA |
| | | −40°C ≤ $T_A$ ≤ +125°C | | | 225 | µA |
| DYNAMIC PERFORMANCE | | | | | | |
| Slew Rate | SR | $R_L$ =10 kΩ | | 0.4 | | V/µs |
| Settling Time 0.01% | $t_S$ | G = ±1, 2 V step, $C_L$ = 20 pF, $R_L$ = 1 kΩ | | 10 | | µs |
| Overload Recovery Time | | | | 0.05 | | ms |
| Gain Bandwidth Product | GBP | | | 430 | | kHz |
| Phase Margin | $Ø_M$ | $R_L$ = 10 kΩ, $R_L$ = 100 kΩ, $C_L$ = 20 pF | | 65 | | Degrees |
| NOISE PERFORMANCE | | | | | | |
| Voltage Noise | $e_{n\ p\text{-}p}$ | f = 0.1 Hz to 10 Hz | | 1.2 | | µV p-p |
| Voltage Noise Density | $e_n$ | f = 1 kHz | | 52 | | nV/√Hz |

@ $V_S$ = 2.7 V, $V_{CM}$ = 1.35 V, $V_O$ = 1.35 V, $T_A$ = 25°C, unless otherwise specified.

**Table 4.**

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| INPUT CHARACTERISTICS | | | | | | |
| Offset Voltage | $V_{OS}$ | | | 5 | 16 | µV |
| | | −40°C ≤ $T_A$ ≤ +125°C | | | 30 | µV |
| Input Bias Current | $I_B$ | | | 15 | 25 | pA |
| | | −40°C ≤ $T_A$ ≤ +85°C | | 35 | 125 | pA |
| | | −40°C ≤ $T_A$ ≤ +125°C | | 0.7 | 1.0 | nA |
| Input Offset Current | $I_{OS}$ | | | 20 | 50 | pA |
| | | −40°C ≤ $T_A$ ≤ +125°C | | | 300 | pA |
| Input Voltage Range | | | 0 | | 2.7 | V |
| | | −40°C ≤ $T_A$ ≤ +125°C | 0.2 | | 2.5 | |
| Common-Mode Rejection Ratio | CMRR | $V_{CM}$ = 0 V to 2.7 V | 110 | 130 | | dB |
| | | −40°C ≤ $T_A$ ≤ +125°C, $V_{CM}$ = 0.2 V to 2.5 V | 100 | 125 | | dB |
| Large Signal Voltage Gain | $A_{VO}$ | $R_L$ = 10 kΩ, $V_O$ = 0.1 V to 2.6 V | 110 | 130 | | dB |
| | | −40°C ≤ $T_A$ ≤ +125°C | 105 | 125 | | dB |
| Offset Voltage Drift | $\Delta V_{OS}/\Delta T$ | −40°C ≤ $T_A$ ≤ +125°C | | 0.03 | 0.1 | µV/°C |
| OUTPUT CHARACTERISTICS | | | | | | |
| Output Voltage High | $V_{OH}$ | $R_L$ = 100 kΩ to ground | 2.68 | 2.693 | | V |
| | | −40°C ≤ $T_A$ ≤ +125°C, $R_L$ = 100 kΩ to ground | 2.68 | | | V |
| | | $R_L$ = 10 kΩ to ground | 2.67 | 2.68 | | V |
| | | −40°C ≤ $T_A$ ≤ +125°C, $R_L$ = 10 kΩ to ground | 2.66 | | | V |
| Output Voltage Low | $V_{OL}$ | $R_L$ = 100 kΩ to V+ | | 5 | 7 | mV |
| | | −40°C ≤ $T_A$ ≤ +125°C, $R_L$ = 100 kΩ to V+ | | 6 | 8 | mV |
| | | $R_L$ = 10 kΩ to V+ | | 14 | 20 | mV |
| | | −40°C ≤ $T_A$ ≤ +125°C, $R_L$ = 10 kΩ to V+ | | 20 | 25 | mV |
| Short-Circuit Limit | $I_{SC}$ | | | ±8 | | mA |
| POWER SUPPLY | | | | | | |
| Power Supply Rejection Ratio | PSRR | $V_S$ = 2.7 V to 5.5 V | 105 | 125 | | dB |
| | | −40°C ≤ $T_A$ ≤ +125°C | 100 | 125 | | dB |
| Supply Current/Amplifier | $I_{SY}$ | $I_O$ = 0 | | | 210 | µA |
| | | −40°C ≤ $T_A$ ≤ +125°C | | | 225 | µA |
| DYNAMIC PERFORMANCE | | | | | | |
| Slew Rate | SR | $R_L$ = 10 kΩ | | 0.35 | | V/µs |
| Settling Time 0.01% | $t_S$ | G = ±1, 1 V step, $C_L$ = 20 pF, $R_L$ = ∞ | | 8 | | µs |
| Overload Recovery Time | | | | 0.05 | | ms |
| Gain Bandwidth Product | GBP | | | 430 | | kHz |
| Phase Margin | $Ø_M$ | $R_L$ = 10 kΩ, $R_L$ = 100 kΩ, $C_L$ = 20 pF | | 65 | | Degrees |
| NOISE PERFORMANCE | | | | | | |
| Voltage Noise | $e_{n\,p\text{-}p}$ | f = 0.1 Hz to 10 Hz | | 2.0 | | µV p-p |
| Voltage Noise Density | $e_n$ | f = 1 kHz | | 55 | | nV/√Hz |

# ABSOLUTE MAXIMUM RATINGS

$T_A$ = 25°C, unless otherwise noted.

**Table 5.**

| Parameter | Rating |
|---|---|
| Supply Voltage | +6 V |
| Input Voltage | $V_{SS}$ − 0.3 V to $V_{DD}$ + 0.3 V |
| Differential Input Voltage | ±6 V |
| Output Short-Circuit Duration to GND | Observe derating curve |
| Storage Temperature Range | −65°C to +150°C |
| Lead Temperature (Soldering, 60 sec) | 300°C |
| Operating Temperature Range | −40°C to +125°C |
| Junction Temperature Range | −65°C to +150°C |

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Absolute maximum ratings apply at 25°C, unless otherwise noted.

## THERMAL RESISTANCE

$\theta_{JA}$ is specified for the worst-case conditions, that is, a device soldered in a circuit board for surface-mount packages.

**Table 6. Thermal Characteristics**

| Package Type | $\theta_{JA}$ | $\theta_{JC}$ | Unit |
|---|---|---|---|
| 5-Lead TSOT-23 (UJ-5) | 207 | 61 | °C/W |
| 8-Lead SOIC_N (R-8) | 125 | 43 | °C/W |
| 8-Lead MSOP (RM-8) | 145 | 45 | °C/W |

## ESD CAUTION

**ESD (electrostatic discharge) sensitive device.** Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

# TYPICAL PERFORMANCE CHARACTERISTICS

## AD8538 CHARACTERISTICS

AD8538 only, $V_{SY}$ = 5 V or ±2.5 V, unless otherwise noted.

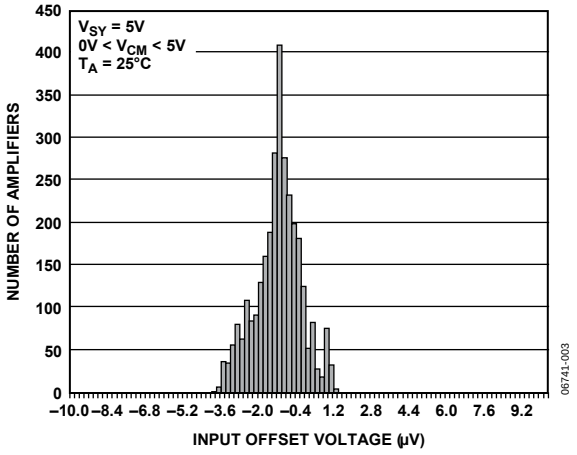



Figure 5. AD8538 Input Offset Voltage Distribution

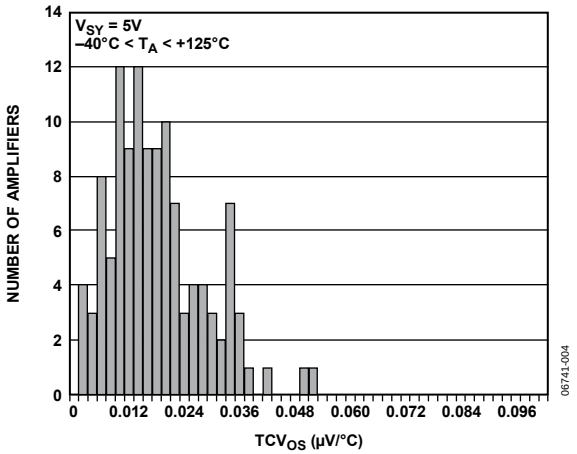



Figure 6. AD8538 Input Offset Voltage Drift Distribution

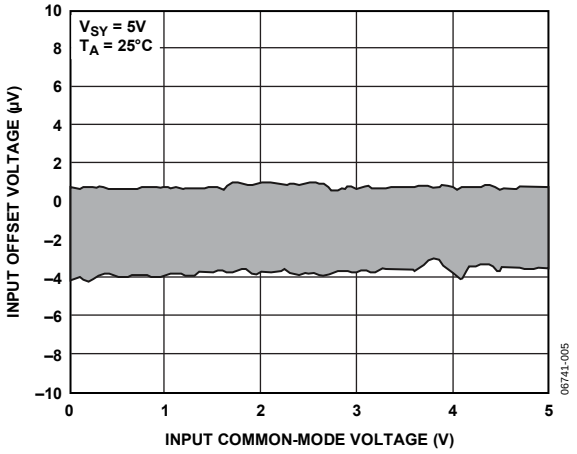



Figure 7. AD8538 Input Offset Voltage vs. Input Common-Mode Voltage

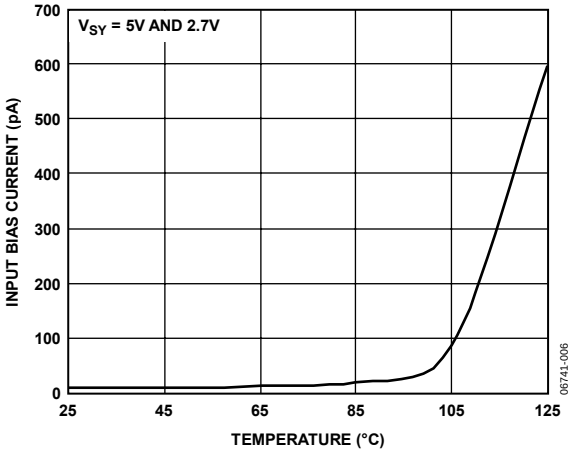



Figure 8. AD8538 Input Bias Current vs. Temperature

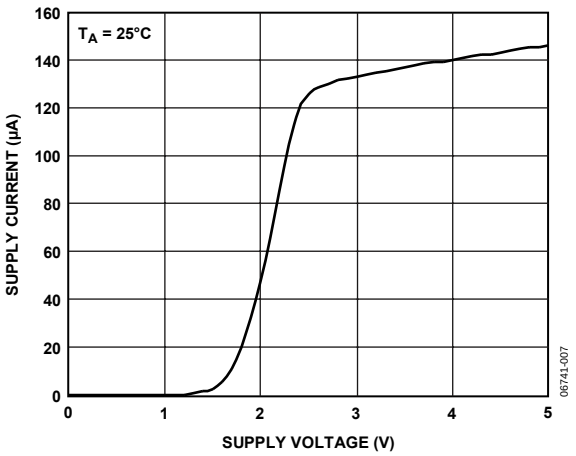



Figure 9. AD8538 Supply Current vs. Supply Voltage

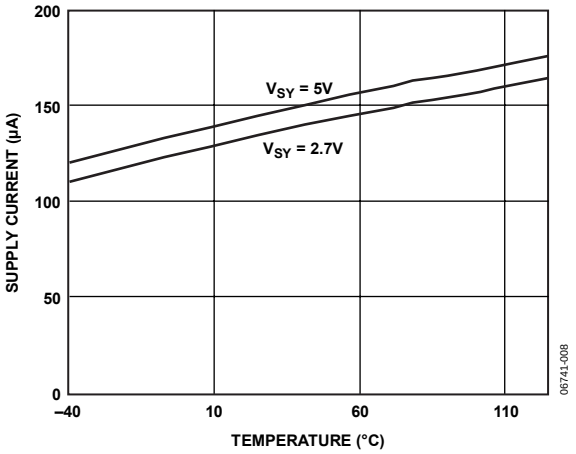



Figure 10. AD8538 Supply Current vs. Temperature

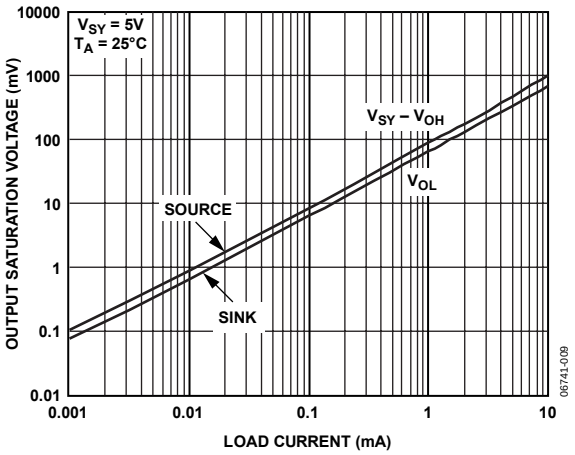



Figure 11. AD8538 Output Saturation Voltage vs. Load Current

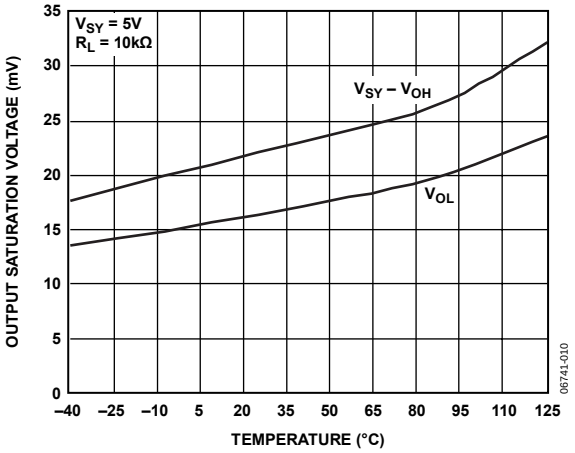



Figure 12. AD8538 Output Saturation Voltage vs. Temperature

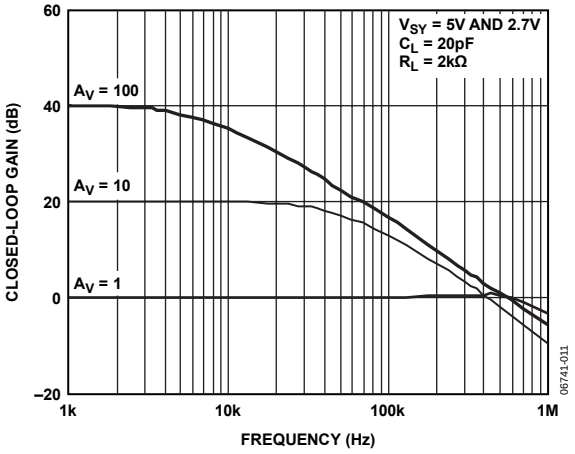



Figure 13. AD8538 Closed-Loop Gain vs. Frequency

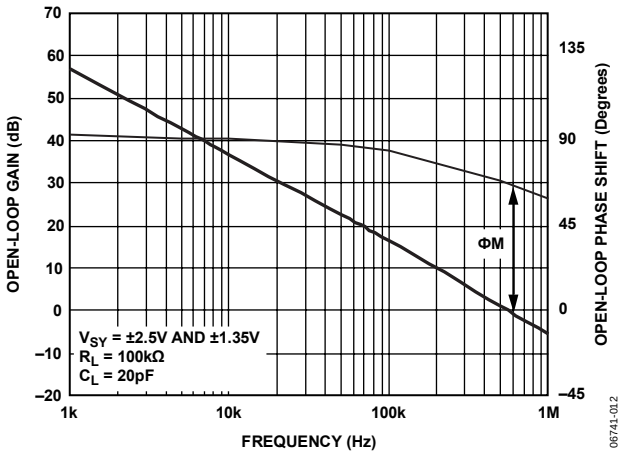



Figure 14. AD8538 Open-Loop Gain and Phase vs. Frequency

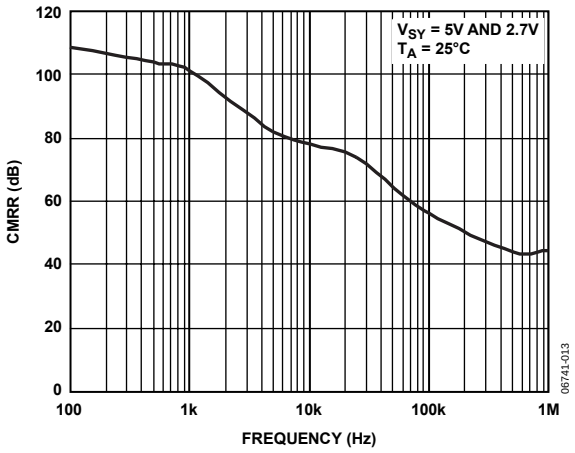



Figure 15. AD8538 CMRR vs. Frequency

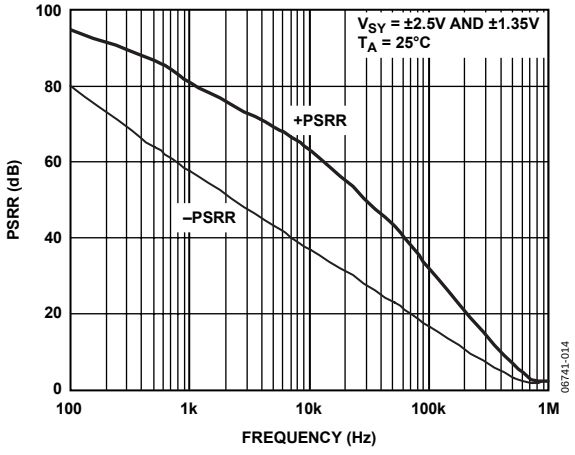



Figure 16. AD8538 PSRR vs. Frequency

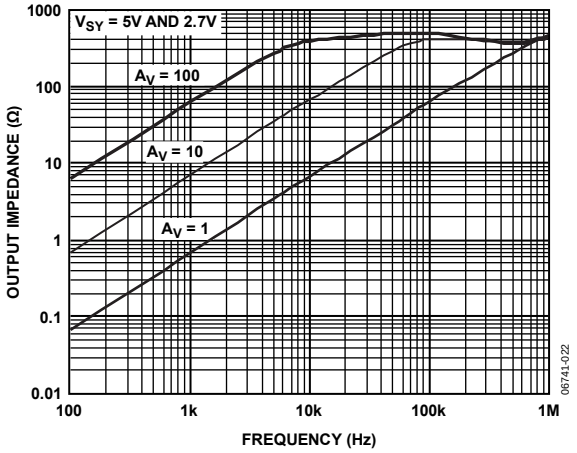



Figure 17. AD8538 Closed-Loop Output Impedance vs. Frequency

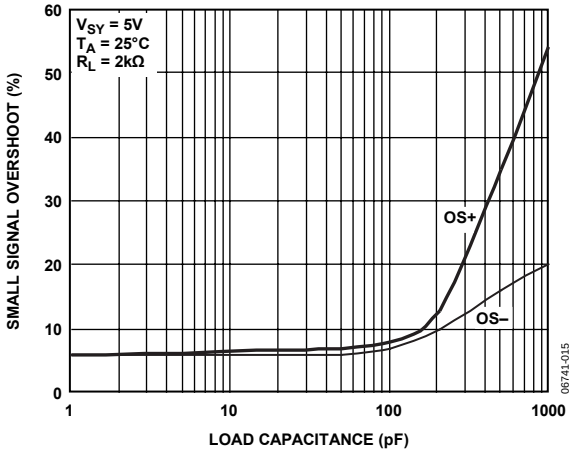



Figure 18. AD8538 Small Signal Overshoot vs. Load Capacitance

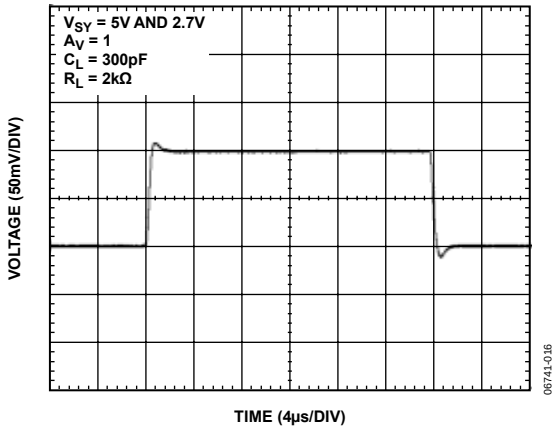



Figure 19. AD8538 Small Signal Transient Response

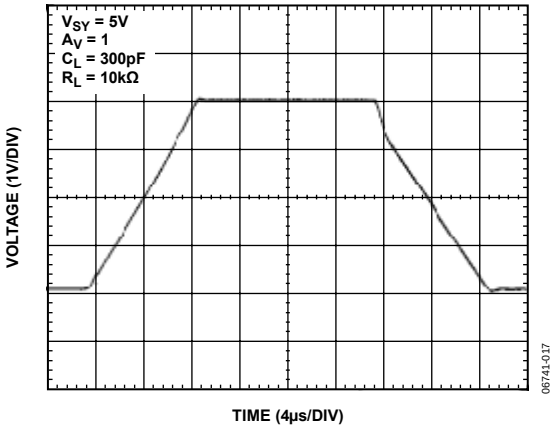



Figure 20. AD8538 Large Signal Transient Response

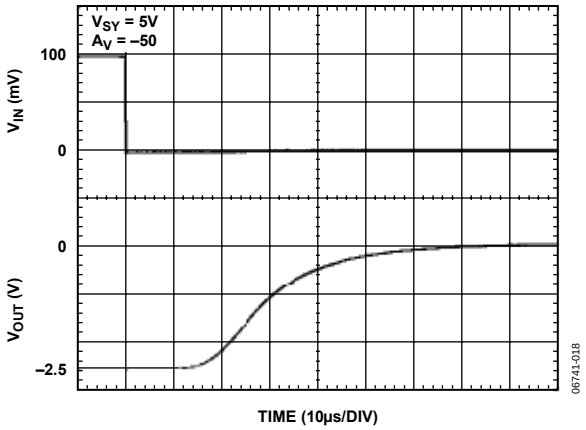



Figure 21. AD8538 Positive Overload Recovery

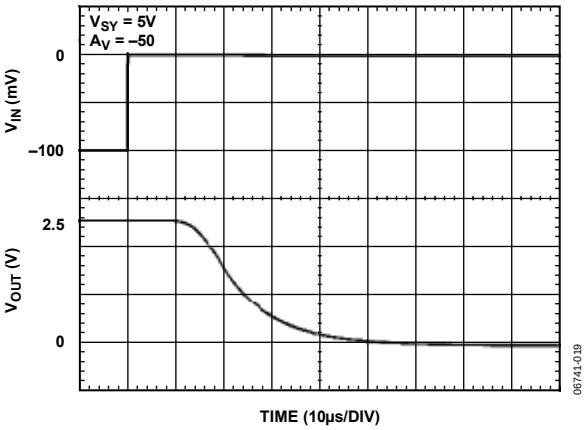



Figure 22. AD8538 Negative Overload Recovery

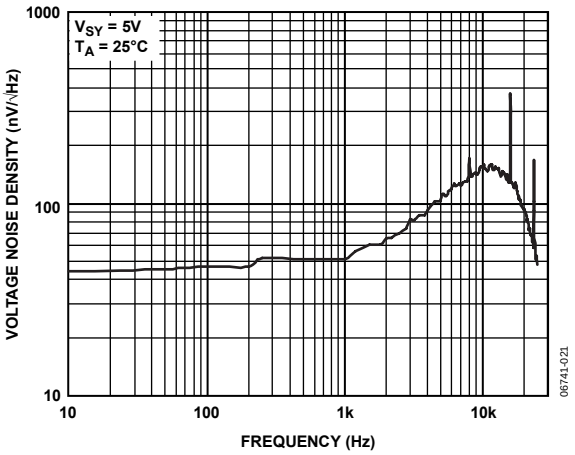



Figure 23. AD8538 Voltage Noise Density

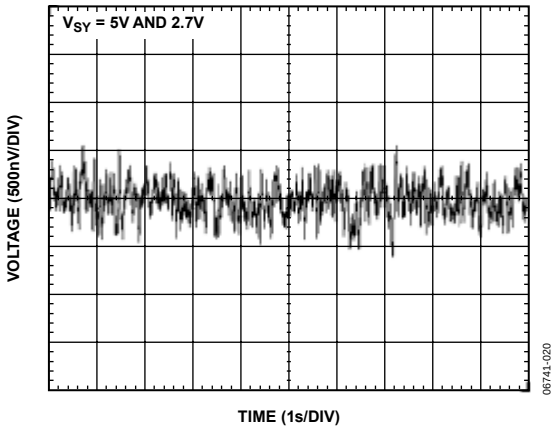



Figure 24. AD8538 0.1 Hz to 10 Hz Input Voltage Noise

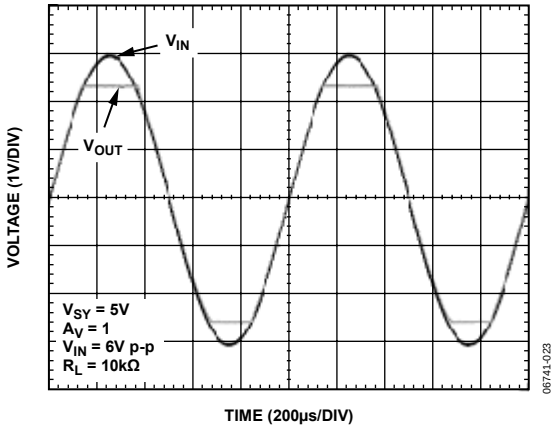



Figure 25. AD8538 No Phase Reversal

$V_{SY}$ = 2.7 V or ±1.35 V, AD8538 only, unless otherwise noted.

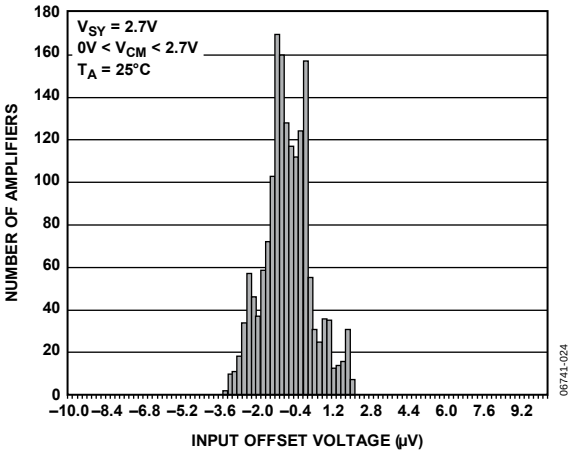



Figure 26. AD8538 Input Offset Voltage Distribution

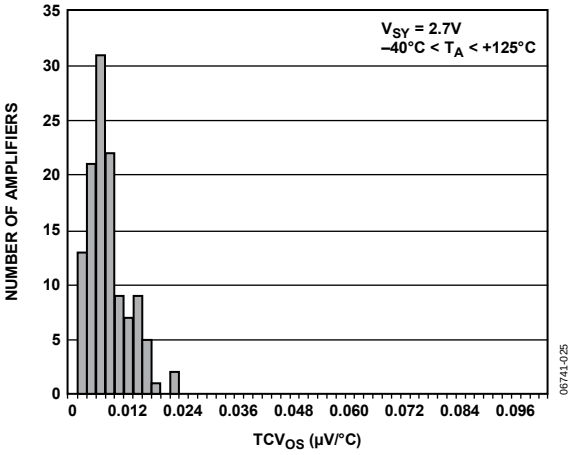



Figure 27. AD8538 Input Offset Voltage Drift Distribution

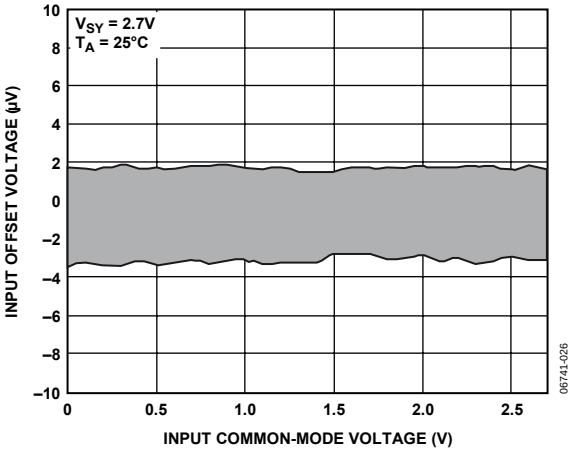



Figure 28. AD8538 Input Offset Voltage vs. Input Common-Mode Voltage

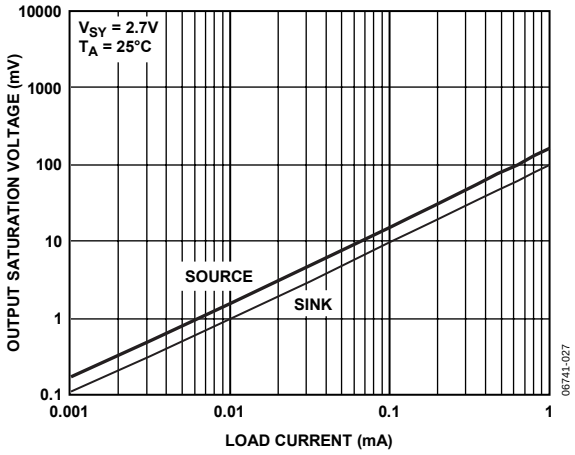



Figure 29. AD8538 Output Saturation Voltage vs. Load Current

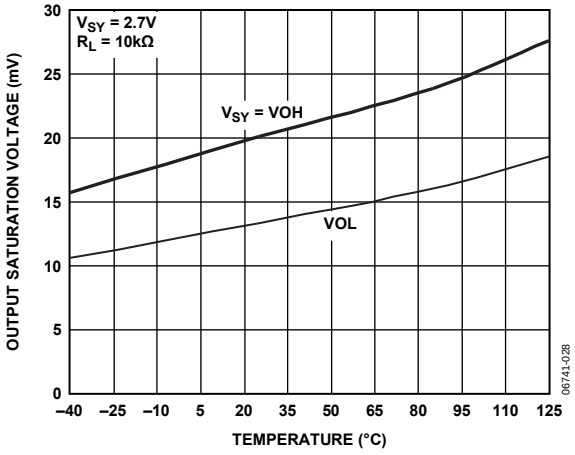



Figure 30. AD8538 Output Saturation Voltage vs. Temperature

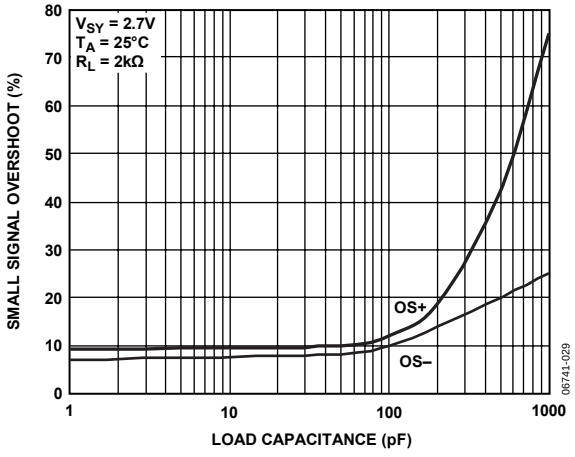



Figure 31. AD8538 Small Signal Overshoot vs. Load Capacitance

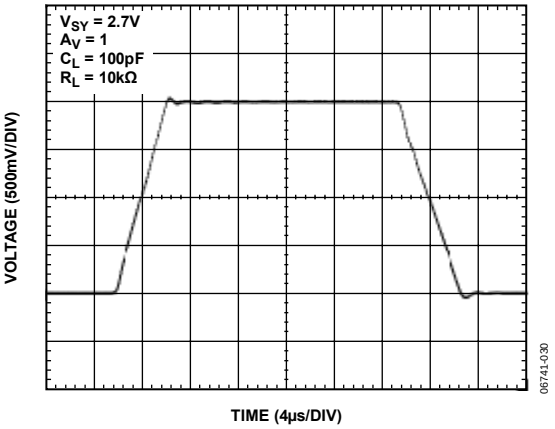



*Figure 32. AD8538 Large Signal Transient Response*

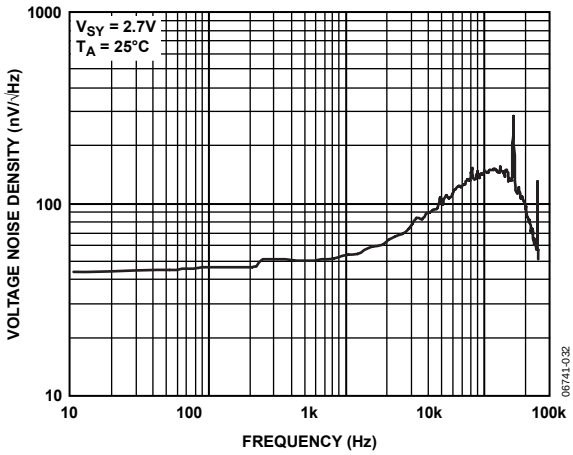



*Figure 33. AD8538 Voltage Noise Density*

## AD8539 CHARACTERISTICS

AD8539 only, $V_S$ = 5 V or ±2.5 V, unless otherwise noted.

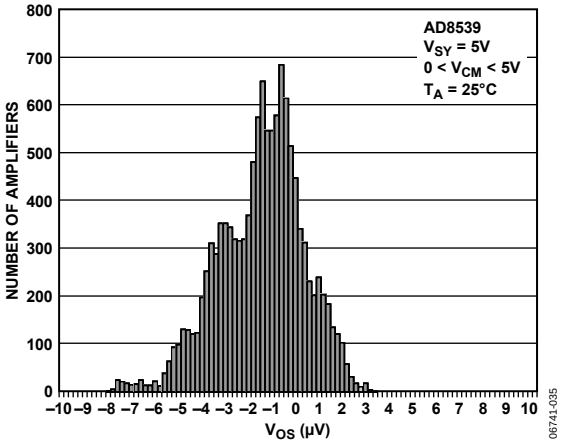



Figure 34. AD8539 Input Offset Voltage Distribution

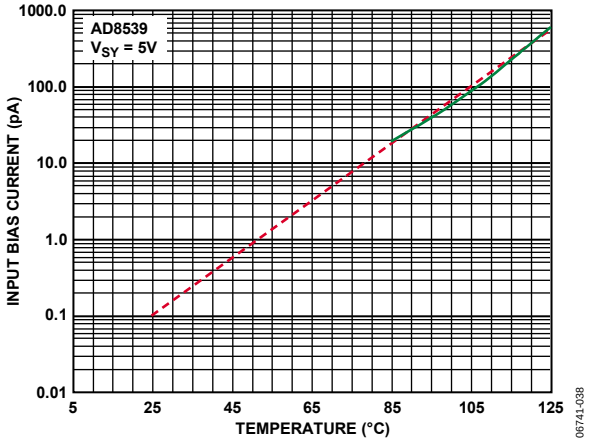



Figure 37. AD8539 Input Bias Current vs. Temperature

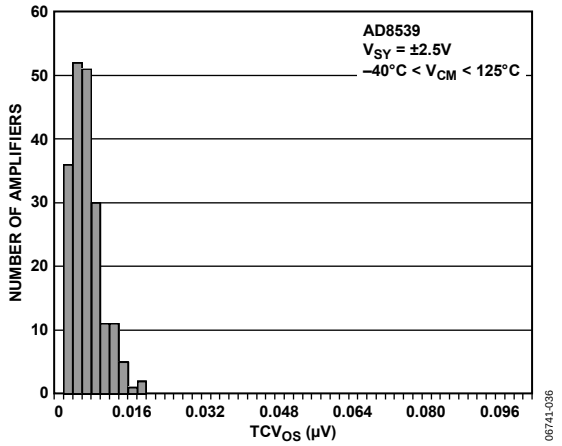



Figure 35. AD8539 Input Offset Voltage Drift Distribution

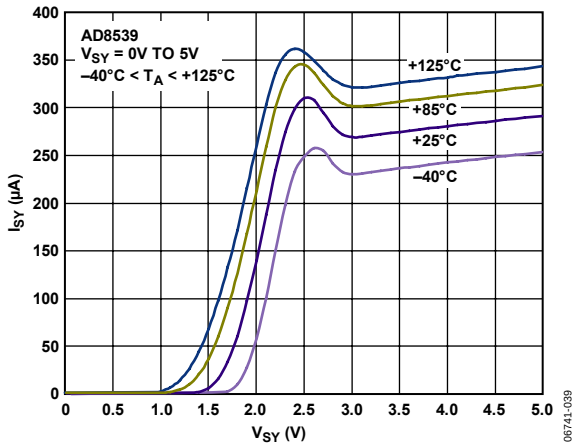



Figure 38. AD8539 Supply Current vs. Supply Voltage

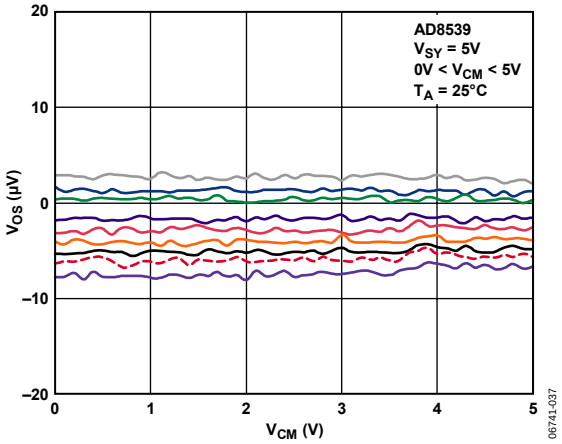



Figure 36. AD8539 Input Offset Voltage vs. Input Common-Mode Voltage

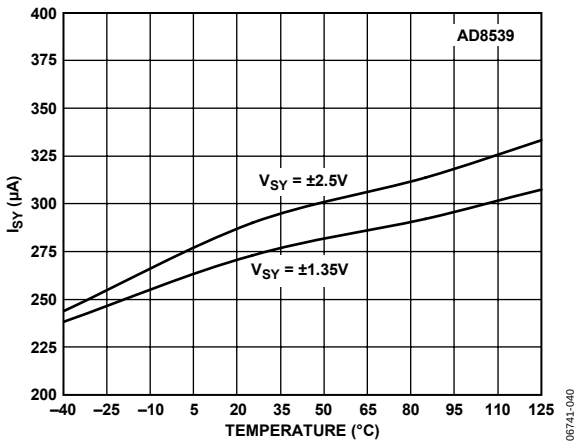



Figure 39. AD8539 Supply Current vs. Temperature

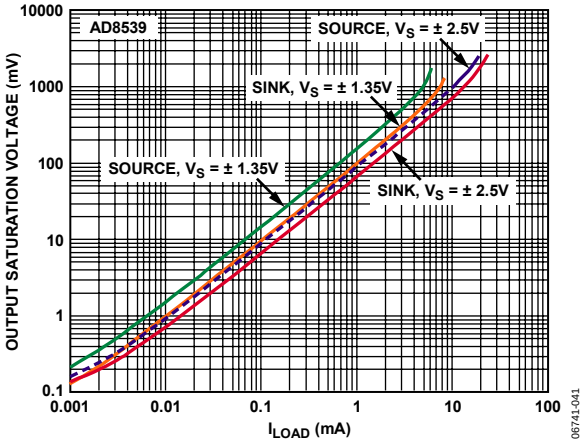



Figure 40. AD8539 Output Saturation Voltage vs. Load Current

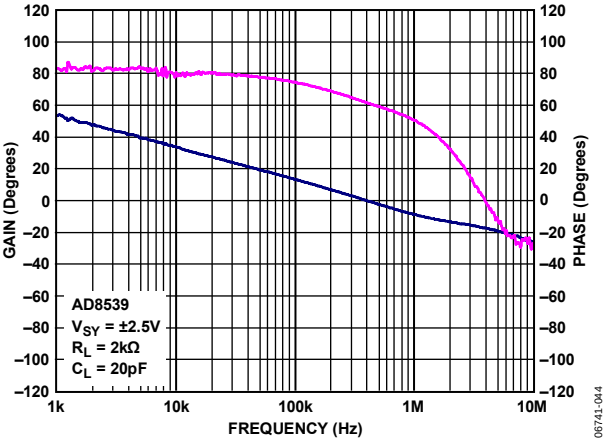



Figure 43. AD8539 Open-Loop Gain and Phase vs. Frequency

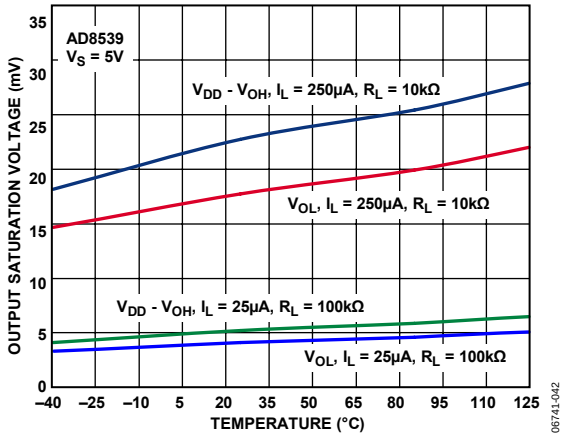



Figure 41. AD8539 Output Saturation Voltage vs. Temperature

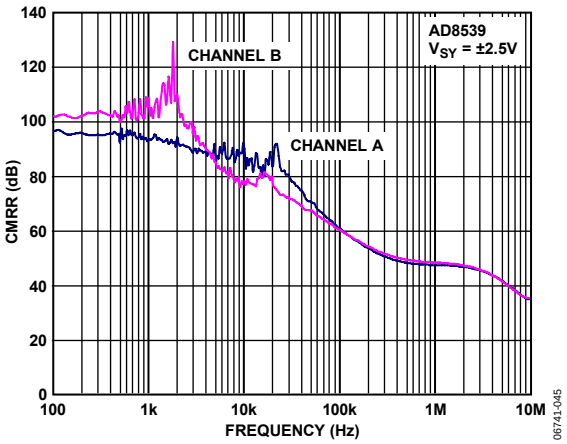



Figure 44. AD8539 CMRR vs. Frequency

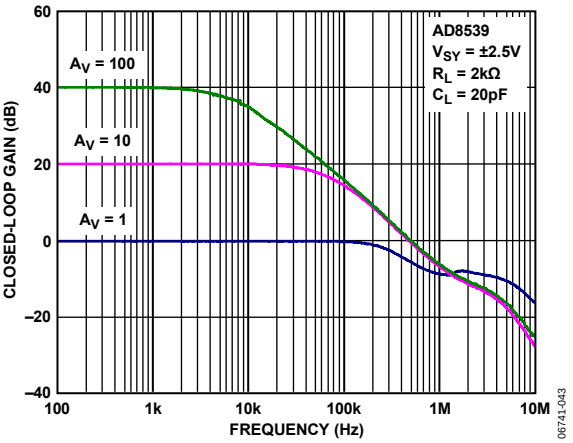



Figure 42. AD8539 Closed-Loop Gain vs. Frequency

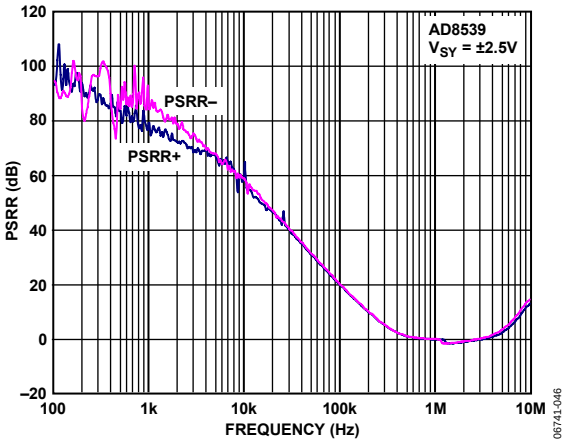



Figure 45. AD8539 PSRR vs. Frequency

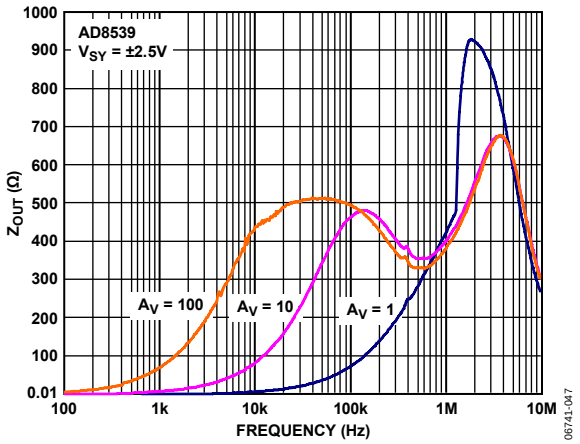



Figure 46. AD8539 Closed-Loop Output Impedance vs. Frequency

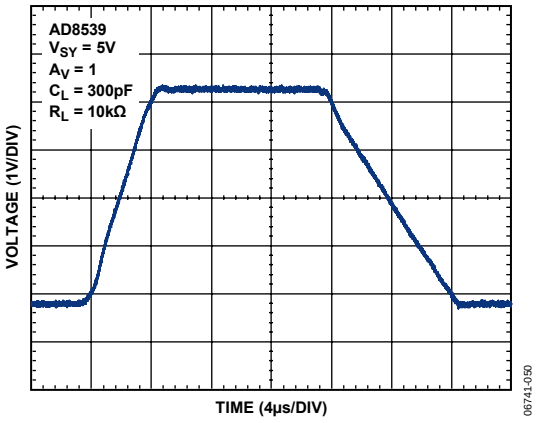



Figure 49. AD8539 Large Signal Transient Response

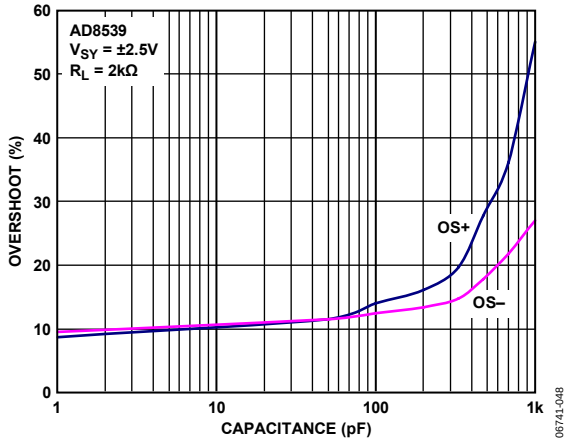



Figure 47. AD8539 Small Signal Overshoot vs. Load Capacitance

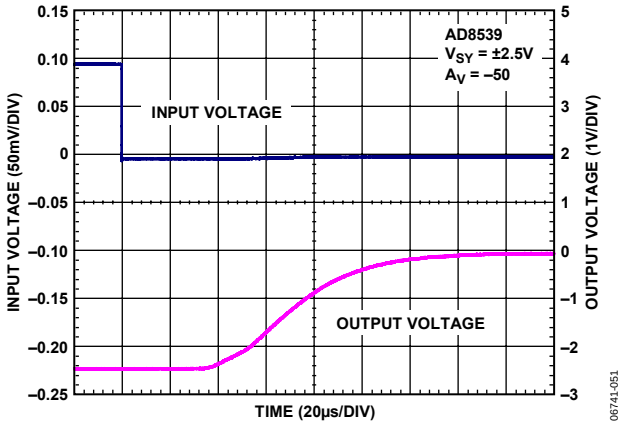



Figure 50. AD8539 Positive Overload Recovery

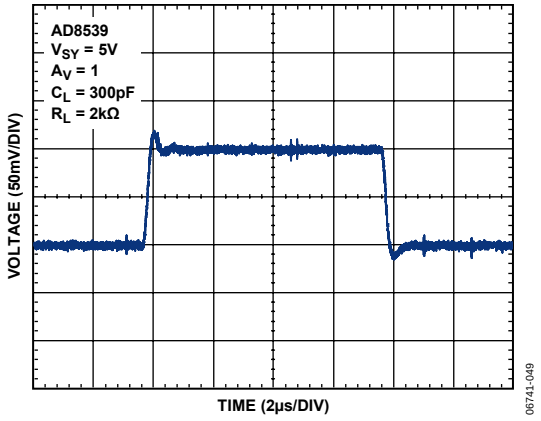



Figure 48. AD8539 Small Signal Transient Response

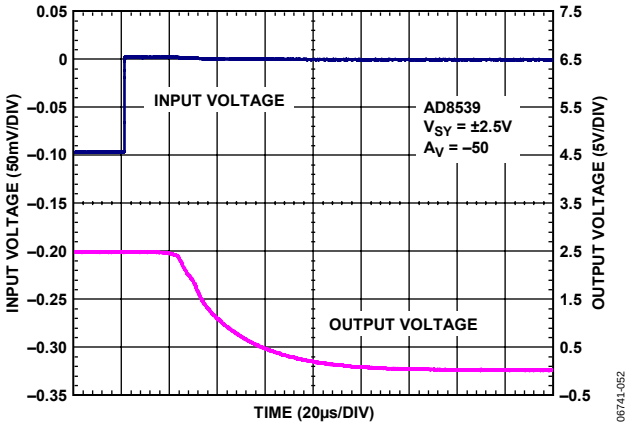



Figure 51. AD8539 Negative Overload Recovery

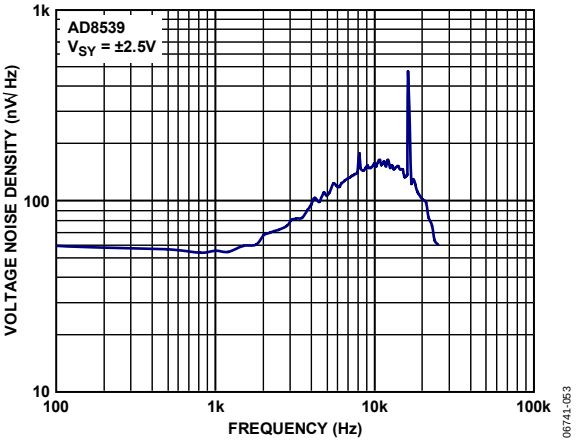



Figure 52. AD8539 Voltage Noise Density

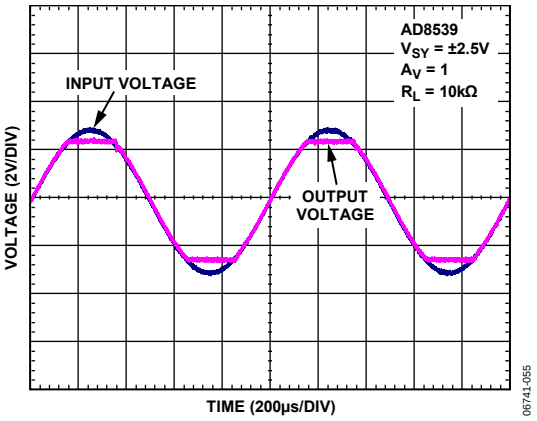



Figure 54. AD8539 No Phase Reversal

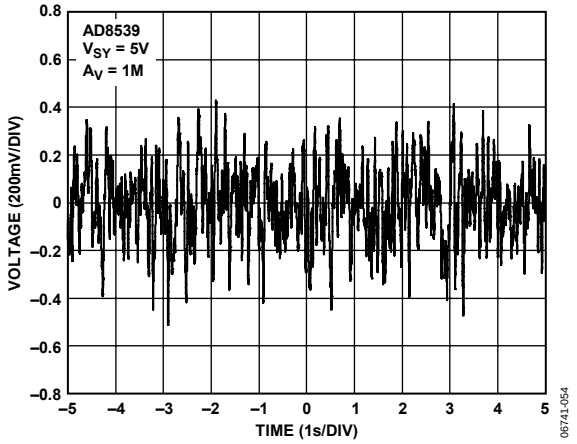



Figure 53. AD8539 0.1 Hz to 10 Hz Input Voltage Noise

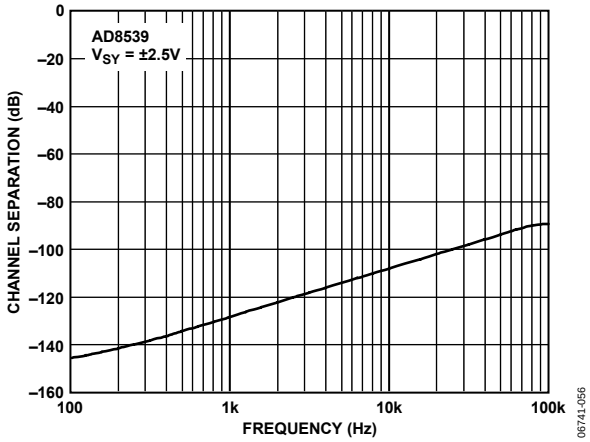



Figure 55. AD8539 Channel Separation vs. Frequency

$V_S$ = 2.7 V or ±1.35 V, $T_A$ = 25°C, AD8539 only, unless otherwise noted.

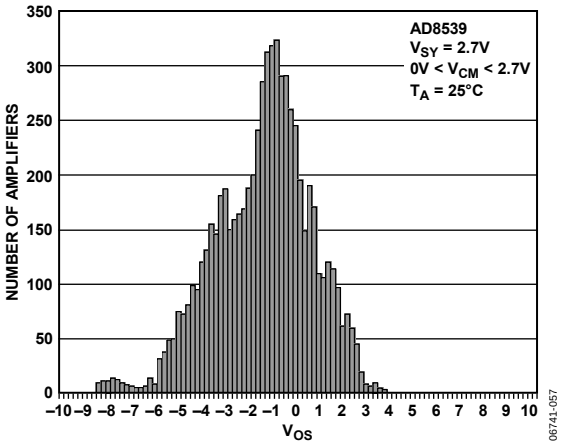



Figure 56. AD8539 Input Offset Voltage Distribution

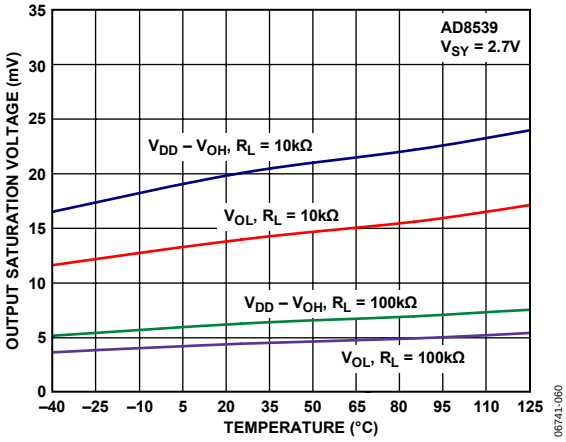



Figure 59. AD8539 Output Saturation Voltage vs. Temperature

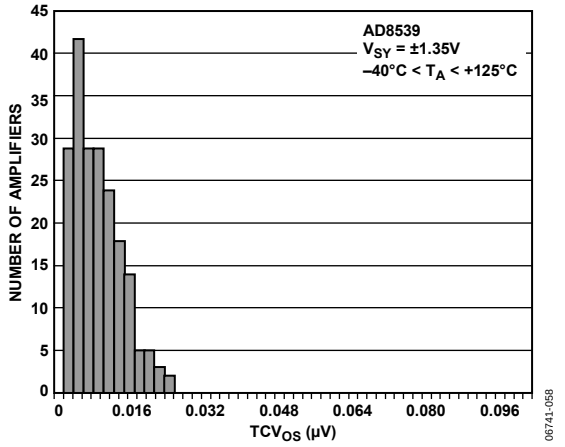



Figure 57. AD8539 Input Offset Voltage Drift Distribution

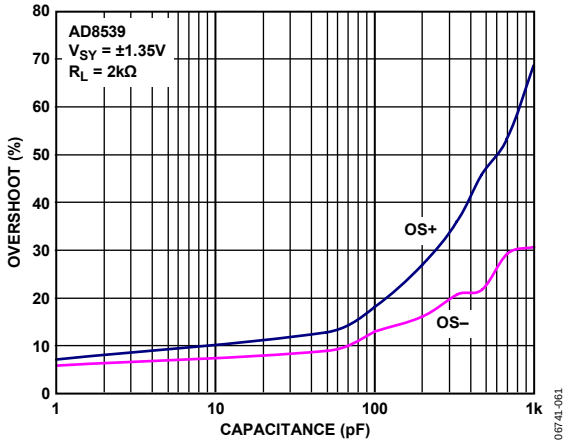



Figure 60. AD8539 Small Signal Overshoot vs. Load Capacitance

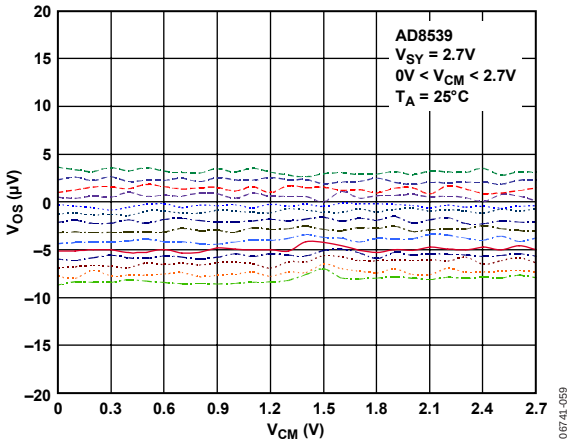



Figure 58. AD8539 Input Offset Voltage vs. Input Common-Mode Voltage

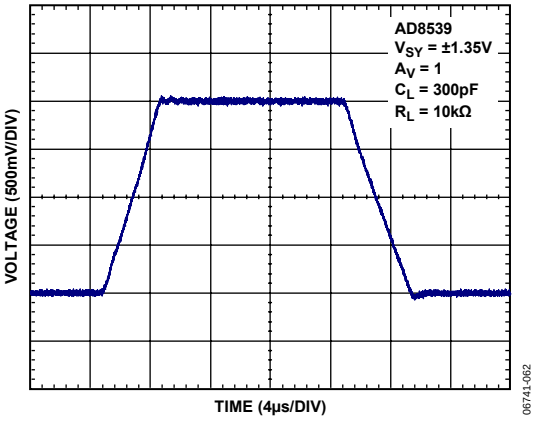



Figure 61. AD8539 Large Signal Transient Response

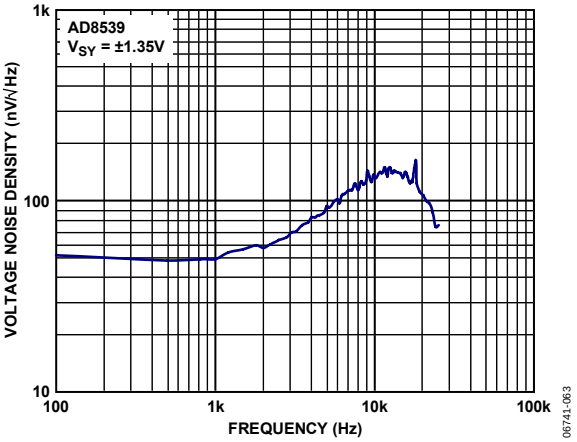



Figure 62. AD8539 Voltage Noise Density

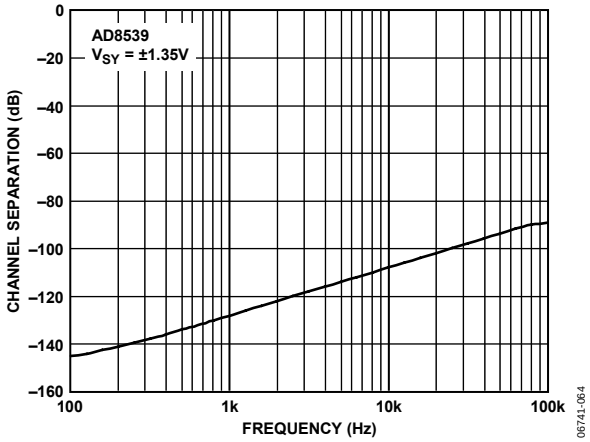
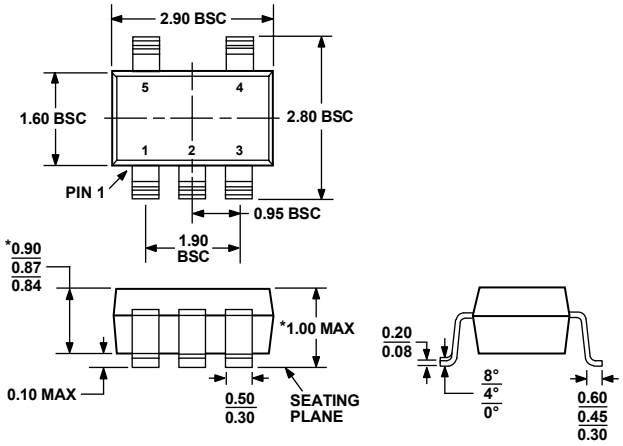


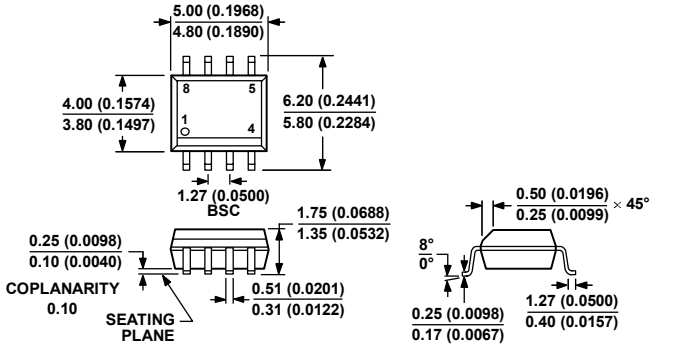

Figure 63. AD8539 Channel Separation vs. Frequency

# OUTLINE DIMENSIONS




*COMPLIANT TO JEDEC STANDARDS MO-193-AB WITH THE EXCEPTION OF PACKAGE HEIGHT AND THICKNESS.

*Figure 64. 5-Lead Thin Small Outline Transistor Package [TSOT-23]*
*(UJ-5)*
*Dimensions shown in millimeters*




COMPLIANT TO JEDEC STANDARDS MS-012-AA
CONTROLLING DIMENSIONS ARE IN MILLIMETERS; INCH DIMENSIONS (IN PARENTHESES) ARE ROUNDED-OFF MILLIMETER EQUIVALENTS FOR REFERENCE ONLY AND ARE NOT APPROPRIATE FOR USE IN DESIGN.

012407-A

*Figure 65. 8-Lead Standard Small Outline Package [SOIC_N]*
*Narrow Body*
*(R-8)*

*Dimensions shown in millimeters and (inches)*

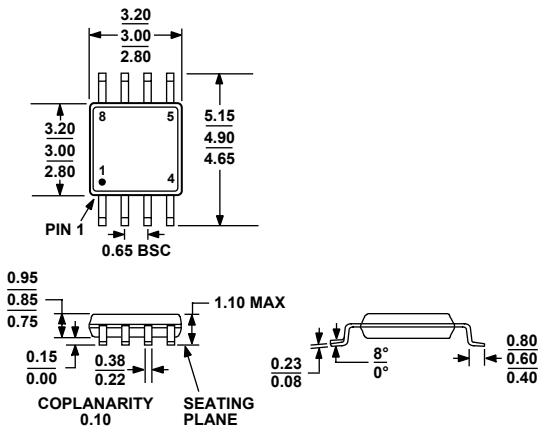



*Figure 66. 8-Lead Mini Small Outline Package [MSOP]*
*(RM-8)*
*Dimensions shown in millimeters*

## ORDERING GUIDE

| Model | Temperature Range | Package Description | Package Option | Branding |
|---|---|---|---|---|
| AD8538AUJZ-R2[1] | –40°C to +125°C | 5-Lead TSOT-23 | UJ-5 | A0C |
| AD8538AUJZ-REEL[1] | –40°C to +125°C | 5-Lead TSOT-23 | UJ-5 | A0C |
| AD8538AUJZ-REEL7[1] | –40°C to +125°C | 5-Lead TSOT-23 | UJ-5 | A0C |
| AD8538ARZ[1] | –40°C to +125°C | 8-Lead SOIC_N | R-8 | |
| AD8538ARZ-REEL[1] | –40°C to +125°C | 8-Lead SOIC_N | R-8 | |
| AD8538ARZ-REEL7[1] | –40°C to +125°C | 8-Lead SOIC_N | R-8 | |
| AD8539ARMZ-R2[1] | –40°C to +125°C | 8-Lead MSOP | RM-8 | A1S |
| AD8539ARMZ-REEL[1] | –40°C to +125°C | 8-Lead MSOP | RM-8 | A1S |
| AD8539ARZ[1] | –40°C to +125°C | 8-Lead SOIC_N | R-8 | |
| AD8539ARZ-REEL[1] | –40°C to +125°C | 8-Lead SOIC_N | R-8 | |
| AD8539ARZ-REEL7[1] | –40°C to +125°C | 8-Lead SOIC_N | R-8 | |

[1] Z = RoHS Compliant Part.

## NOTES

## NOTES

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