

FEATURES

- Supports defense and aerospace applications (AQEC standard)
- Military temperature range (-55°C to $+125^{\circ}\text{C}$)
- Controlled manufacturing baseline
- One assembly/test site
- One fabrication site
- Enhanced product change notification
- Qualification data available on request
- Wide bandwidth: 15 MHz
- Low offset voltage: 325 μV maximum
- Low noise: 9.5 nV/ $\sqrt{\text{Hz}}$ @ 1 kHz
- Single-supply operation: 2.7 V to 12 V
- Low supply current: 850 μA maximum
- Rail-to-rail output swing
- Low TCV_{os} : 1 $\mu\text{V}/^{\circ}\text{C}$ typical
- High slew rate: 13 V/ μs
- No phase inversion
- Unity-gain stable

APPLICATIONS

- Portable instrumentation
- Sampling ADC amplifiers
- Precision filters

PIN CONFIGURATION

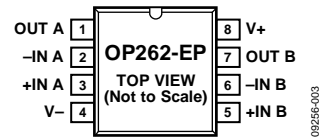


Figure 1. 8-Lead Narrow-Body SOIC (R Suffix)

GENERAL DESCRIPTION

The OP262-EP is a low power, precision op amp that features a rail-to-rail output and a 15 MHz bandwidth. With its low offset voltage of 45 μV (typical) and low noise, it is well suited for precision filter and control applications.

This product operates from a single supply as low as 2.7 V or from dual supplies up to ± 6 V. The OP262-EP is specified over the military temperature range (-55°C to $+125^{\circ}\text{C}$) and is available in an 8-lead SOIC_N package.

Additional applications information is available in the [OP162/OP262/OP462](#) data sheet.

Rev. 0

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REVISION HISTORY

7/10—Revision 0: Initial Version

SPECIFICATIONS

ELECTRICAL CHARACTERISTICS

$V_S = 5.0\text{ V}$, $V_{CM} = 0\text{ V}$, $T_A = 25^\circ\text{C}$, unless otherwise noted.

Table 1.

| Parameter | Symbol | Test Conditions/Comments | Min | Typ | Max | Unit |
|-----------------------------------|--------------------------|---------------------------------------------------------------------------------------------------|------|-----------|----------|------------------------------|
| INPUT CHARACTERISTICS | | | | | | |
| Offset Voltage | V_{OS} | $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | | 45 | 325 | μV |
| Input Bias Current | I_B | $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | | 360 | 600 | nA |
| Input Offset Current | I_{OS} | $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | | ± 2.5 | ± 25 | nA |
| Input Voltage Range | V_{CM} | $0\text{ V} \leq V_{CM} \leq 4.0\text{ V}$, $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | 0 | | 4 | V |
| Common-Mode Rejection | CMRR | $0\text{ V} \leq V_{CM} \leq 4.0\text{ V}$, $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | 70 | 110 | | dB |
| Large Signal Voltage Gain | A_{VO} | $R_L = 2\text{ k}\Omega$, $0.5 \leq V_{OUT} \leq 4.5\text{ V}$ | | 30 | | V/mV |
| | | $R_L = 10\text{ k}\Omega$, $0.5 \leq V_{OUT} \leq 4.5\text{ V}$ | 65 | 88 | | V/mV |
| | | $R_L = 10\text{ k}\Omega$, $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | 40 | | | V/mV |
| Offset Voltage Drift ¹ | $\Delta V_{OS}/\Delta T$ | | | 1 | | $\mu\text{V}/^\circ\text{C}$ |
| Bias Current Drift | $\Delta I_B/\Delta T$ | | | 250 | | $\text{pA}/^\circ\text{C}$ |
| OUTPUT CHARACTERISTICS | | | | | | |
| Output Voltage Swing High | V_{OH} | $I_L = 250\text{ }\mu\text{A}$, $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | 4.95 | 4.99 | | V |
| Output Voltage Swing Low | V_{OL} | $I_L = 250\text{ }\mu\text{A}$, $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | 4.85 | 4.94 | | V |
| Short-Circuit Current | I_{SC} | $I_L = 250\text{ }\mu\text{A}$, $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | | 14 | 50 | mV |
| Maximum Output Current | I_{OUT} | $I_L = 5\text{ mA}$ | | 65 | 150 | mV |
| | | Short to ground | | ± 80 | | mA |
| | | | | ± 30 | | mA |
| POWER SUPPLY | | | | | | |
| Power Supply Rejection Ratio | PSRR | $V_S = 2.7\text{ V to }7\text{ V}$ $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | 90 | 120 | | dB |
| Supply Current/Amplifier | I_{SY} | $V_{OUT} = 2.5\text{ V}$ $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | | 500 | 700 | μA |
| | | | | | 850 | μA |
| DYNAMIC PERFORMANCE | | | | | | |
| Slew Rate | SR | $1\text{ V} < V_{OUT} < 4\text{ V}$, $R_L = 10\text{ k}\Omega$ | | 10 | | V/ μs |
| Settling Time | t_s | To 0.1%, $A_V = -1$, $V_O = 2\text{ V step}$ | | 540 | | ns |
| Gain Bandwidth Product | GBP | | | 15 | | MHz |
| Phase Margin | ϕ_m | | | 61 | | Degrees |
| NOISE PERFORMANCE | | | | | | |
| Voltage Noise | e_n p-p | 0.1 Hz to 10 Hz | | 0.5 | | $\mu\text{V p-p}$ |
| Voltage Noise Density | e_n | $f = 1\text{ kHz}$ | | 9.5 | | $\text{nV}/\sqrt{\text{Hz}}$ |
| Current Noise Density | i_n | $f = 1\text{ kHz}$ | | 0.4 | | $\text{pA}/\sqrt{\text{Hz}}$ |

¹ Offset voltage drift is the average of the -55°C to $+25^\circ\text{C}$ delta and the $+25^\circ\text{C}$ to $+125^\circ\text{C}$ delta.

OP262-EP

$V_S = 3.0\text{ V}$, $V_{CM} = 0\text{ V}$, $T_A = 25^\circ\text{C}$, unless otherwise noted.

Table 2.

| Parameter | Symbol | Test Conditions/Comments | Min | Typ | Max | Unit | |
|-------------------------------|------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------|--------------------------------|--------------|
| INPUT CHARACTERISTICS | | | | | | | |
| Offset Voltage | V_{OS} | $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | | 50 | 325 | μV | |
| Input Bias Current | I_B | | | 360 | 600 | nA | |
| Input Offset Current | I_{OS} | | | ± 2.5 | ± 25 | nA | |
| Input Voltage Range | V_{CM} | | | 0 | 2 | V | |
| Common-Mode Rejection | CMRR | | $0\text{ V} \leq V_{CM} \leq 2.0\text{ V}$, $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | 70 | 110 | | dB |
| Large Signal Voltage Gain | A_{VO} | | $R_L = 2\text{ k}\Omega$, $0.5\text{ V} \leq V_{OUT} \leq 2.5\text{ V}$ $R_L = 10\text{ k}\Omega$, $0.5\text{ V} \leq V_{OUT} \leq 2.5\text{ V}$ | 20 | 30 | | V/mV V/mV |
| OUTPUT CHARACTERISTICS | | | | | | | |
| Output Voltage Swing High | V_{OH} | $I_L = 250\ \mu\text{A}$ $I_L = 5\text{ mA}$ | 2.95 2.85 | 2.99 2.93 | | V V | |
| Output Voltage Swing Low | V_{OL} | $I_L = 250\ \mu\text{A}$ $I_L = 5\text{ mA}$ | | 14 66 | 50 150 | mV mV | |
| POWER SUPPLY | | | | | | | |
| Power Supply Rejection Ratio | PSRR | $V_S = 2.7\text{ V to } 7\text{ V}$ $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | 60 | 110 | | dB dB | |
| Supply Current/Amplifier | I_{SY} | $V_{OUT} = 1.5\text{ V}$ $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | | 500 | 650 850 | μA μA | |
| DYNAMIC PERFORMANCE | | | | | | | |
| Slew Rate | SR | $R_L = 10\text{ k}\Omega$ | | 10 | | V/ μs | |
| Settling Time | t_s | To 0.1%, $A_v = -1$, $V_O = 2\text{ V step}$ | | 575 | | ns | |
| Gain Bandwidth Product | GBP | | | 15 | | MHz | |
| Phase Margin | ϕ_m | | | 59 | | Degrees | |
| NOISE PERFORMANCE | | | | | | | |
| Voltage Noise | $e_n\text{ p-p}$ | 0.1 Hz to 10 Hz | | 0.5 | | $\mu\text{V p-p}$ | |
| Voltage Noise Density | e_n | $f = 1\text{ kHz}$ | | 9.5 | | nV/ $\sqrt{\text{Hz}}$ | |
| Current Noise Density | i_n | $f = 1\text{ kHz}$ | | 0.4 | | pA/ $\sqrt{\text{Hz}}$ | |

$V_S = \pm 5.0\text{ V}$, $V_{CM} = 0\text{ V}$, $T_A = 25^\circ\text{C}$, unless otherwise noted.

Table 3.

| Parameter | Symbol | Test Conditions/Comments | Min | Typ | Max | Unit |
|---------------------------------------|--------------------------|-------------------------------------------------------------------------------------------------------|-------------------|-----------|----------------|------------------------------|
| INPUT CHARACTERISTICS | | | | | | |
| Offset Voltage | V_{OS} | $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | | 25 | 325 | μV |
| Input Bias Current | I_B | $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | | 260 | 500 | nA |
| Input Offset Current | I_{OS} | $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | | ± 2.5 | ± 25 | nA |
| Input Voltage Range | V_{CM} | $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | -5 | | ± 4 | V |
| Common-Mode Rejection | CMRR | $-4.9\text{ V} \leq V_{CM} \leq +4.0\text{ V}$, $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | 70 | 110 | | dB |
| Large Signal Voltage Gain | A_{VO} | $R_L = 2\text{ k}\Omega$, $-4.5\text{ V} \leq V_{OUT} \leq +4.5\text{ V}$ | | 35 | | V/mV |
| | | $R_L = 10\text{ k}\Omega$, $-4.5\text{ V} \leq V_{OUT} \leq +4.5\text{ V}$ | 75 | 120 | | V/mV |
| Long-Term Offset Voltage ¹ | V_{OS} | $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | | | 600 | μV |
| Offset Voltage Drift ² | $\Delta V_{OS}/\Delta T$ | | | 1 | | $\mu\text{V}/^\circ\text{C}$ |
| Bias Current Drift | $\Delta I_B/\Delta T$ | | | 250 | | $\text{pA}/^\circ\text{C}$ |
| OUTPUT CHARACTERISTICS | | | | | | |
| Output Voltage Swing High | V_{OH} | $I_L = 250\ \mu\text{A}$, $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | 4.95 | 4.99 | | V |
| | | $I_L = 5\text{ mA}$ | 4.85 | 4.94 | | V |
| Output Voltage Swing Low | V_{OL} | $I_L = 250\ \mu\text{A}$, $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | | -4.99 | -4.95 | V |
| | | $I_L = 5\text{ mA}$ | | -4.94 | -4.85 | V |
| Short-Circuit Current | I_{SC} | Short to ground | | ± 80 | | mA |
| Maximum Output Current | I_{OUT} | | | ± 30 | | mA |
| POWER SUPPLY | | | | | | |
| Power Supply Rejection Ratio | PSRR | $V_S = \pm 1.35\text{ V to } \pm 6\text{ V}$ $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | 60 | 110 | | dB |
| Supply Current/Amplifier | I_{SY} | $V_{OUT} = 0\text{ V}$ | | 650 | 800 | μA |
| | | $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | | | 1.15 | mA |
| | | $V_{OUT} = 0\text{ V}$ | | 550 | 775 | μA |
| | | $-55^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ | | | 1 | mA |
| Supply Voltage Range | V_S | | 3.0 (± 1.5) | | 12 (± 6) | V |
| DYNAMIC PERFORMANCE | | | | | | |
| Slew Rate | SR | $-4\text{ V} < V_{OUT} < +4\text{ V}$, $R_L = 10\text{ k}\Omega$ | | 13 | | V/ μs |
| Settling Time | t_S | To 0.1%, $A_V = -1$, $V_O = 2\text{ V}$ step | | 475 | | ns |
| Gain Bandwidth Product | GBP | | | 15 | | MHz |
| Phase Margin | ϕ_m | | | 64 | | Degrees |
| NOISE PERFORMANCE | | | | | | |
| Voltage Noise | e_n p-p | 0.1 Hz to 10 Hz | | 0.5 | | $\mu\text{V p-p}$ |
| Voltage Noise Density | e_n | $f = 1\text{ kHz}$ | | 9.5 | | $\text{nV}/\sqrt{\text{Hz}}$ |
| Current Noise Density | i_n | $f = 1\text{ kHz}$ | | 0.4 | | $\text{pA}/\sqrt{\text{Hz}}$ |

¹ Long-term offset voltage is guaranteed by a 1000 hour life test performed on three independent lots at 125°C, with an LTPD of 1.3.

² Offset voltage drift is the average of the -55°C to +25°C delta and the +25°C to +125°C delta.

ABSOLUTE MAXIMUM RATINGS

Table 4.

| Parameter | Min |
|------------------------------------------------|-------------------------|
| Supply Voltage | ±6 V |
| Input Voltage ¹ | ±6 V |
| Differential Input Voltage ² | ±0.6 V |
| Internal Power Dissipation SOIC (S) | Observe Derating Curves |
| Output Short-Circuit Duration | Observe Derating Curves |
| Storage Temperature Range | –65°C to +150°C |
| Operating Temperature Range | –55°C to +125°C |
| Junction Temperature Range | –65°C to +150°C |
| Lead Temperature Range, (Soldering, 10 sec) | 300°C |

¹ For supply voltages greater than 6 V, the input voltage is limited to less than or equal to the supply voltage.

² For differential input voltages greater than 0.6 V, the input current should be limited to less than 5 mA to prevent degradation or destruction of the input devices.

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.

Table 5.

| Package Type | θ_{JA} ¹ | θ_{JC} | Unit |
|-----------------|----------------------------|---------------|------|
| 8-Lead SOIC (R) | 157 | 56 | °C/W |

¹ θ_{JA} is specified for the worst-case conditions, that is, θ_{JA} is specified for a device soldered in circuit board for SOIC package.

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

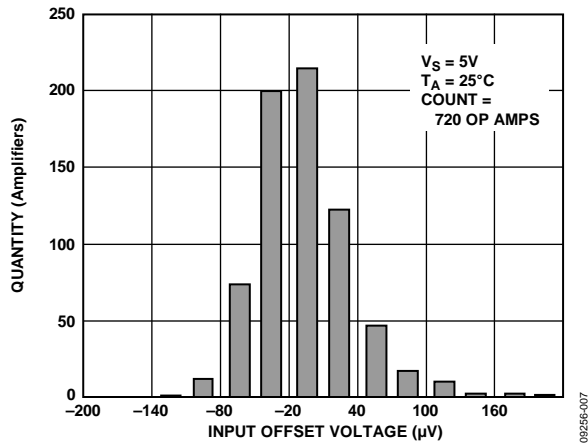


Figure 2. Input Offset Voltage Distribution

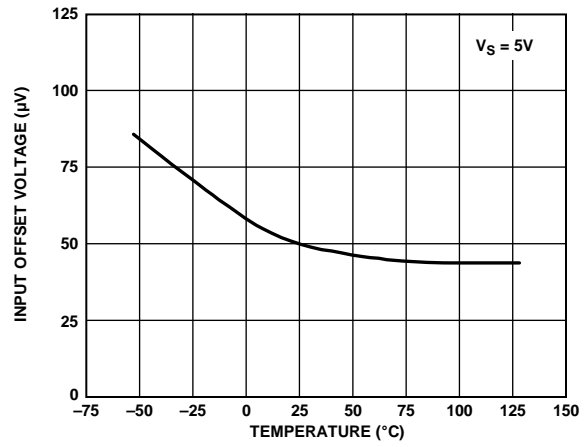


Figure 5. Input Offset Voltage vs. Temperature

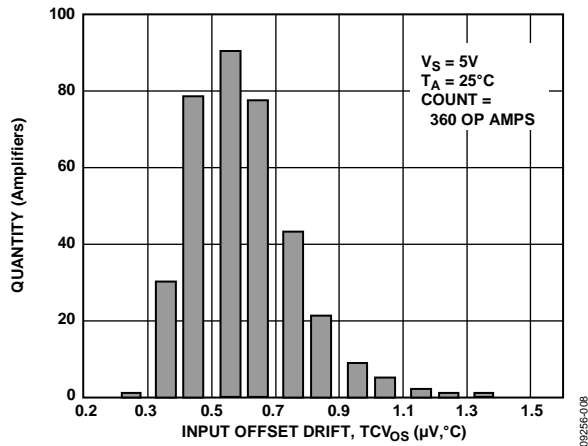


Figure 3. Input Offset Voltage Drift (TCV_{0S})

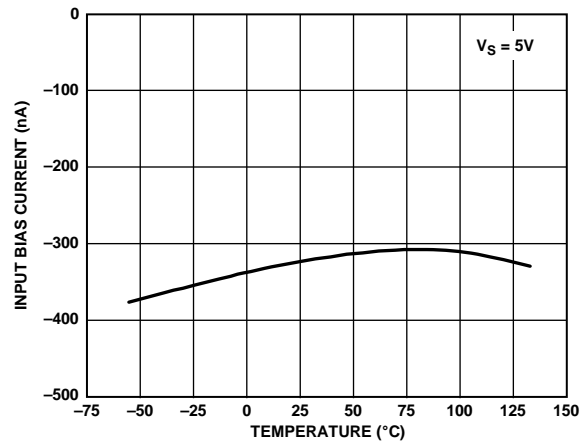


Figure 6. Input Bias Current vs. Temperature

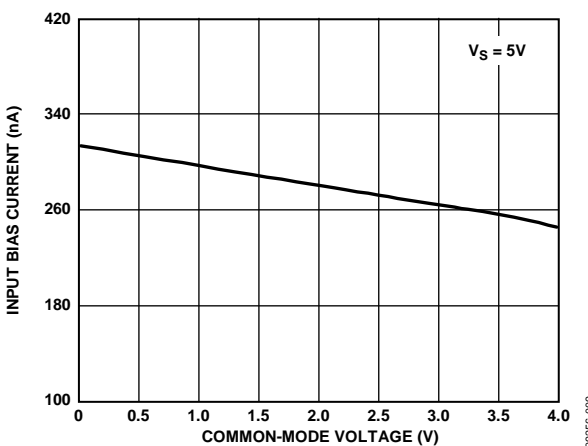


Figure 4. Input Bias Current vs. Common-Mode Voltage

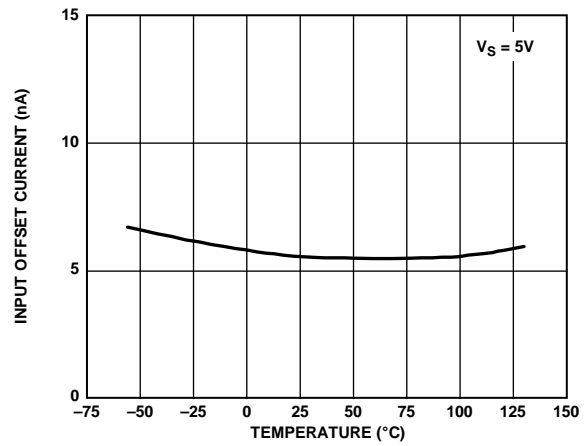


Figure 7. Input Offset Current vs. Temperature

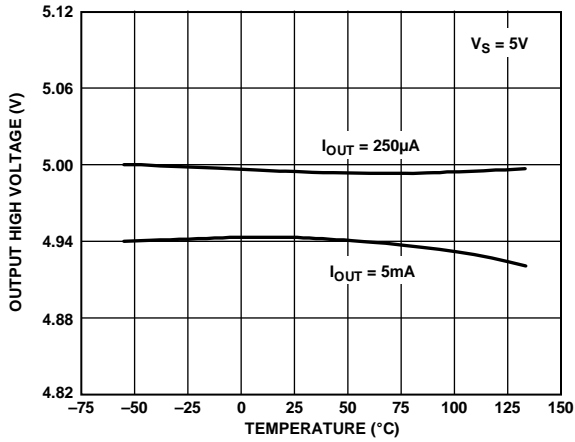


Figure 8. Output High Voltage vs. Temperature

09256-013

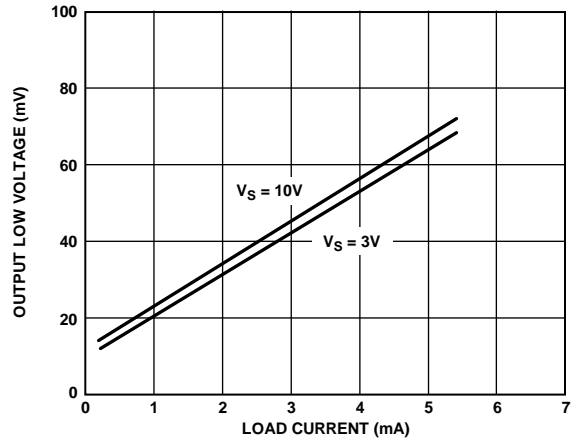


Figure 11. Output Low Voltage to Supply Rail vs. Load Current

09256-016

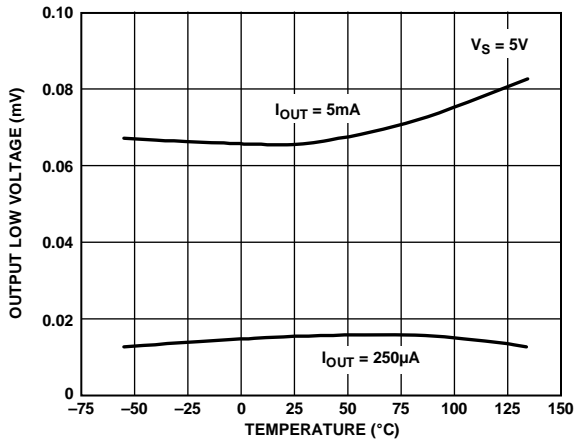


Figure 9. Output Low Voltage vs. Temperature

09256-014

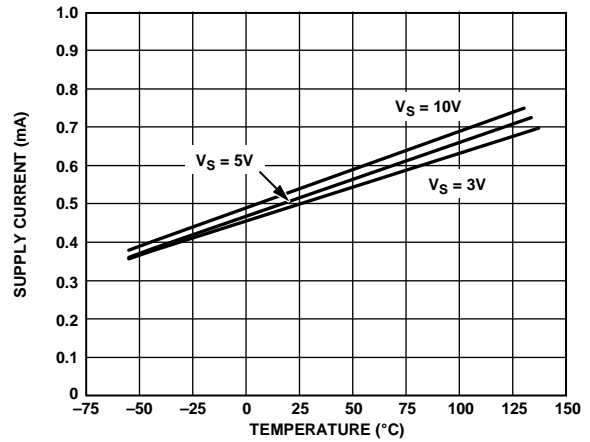


Figure 12. Supply Current/Amplifier vs. Temperature

09256-017

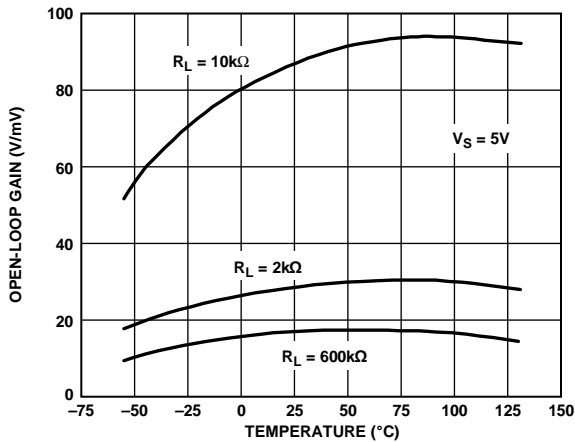


Figure 10. Open-Loop Gain vs. Temperature

09256-015

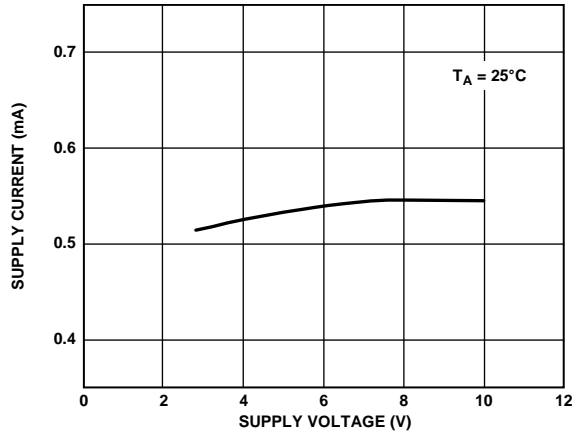


Figure 13. Supply Current/Amplifier vs. Supply Voltage

09256-018

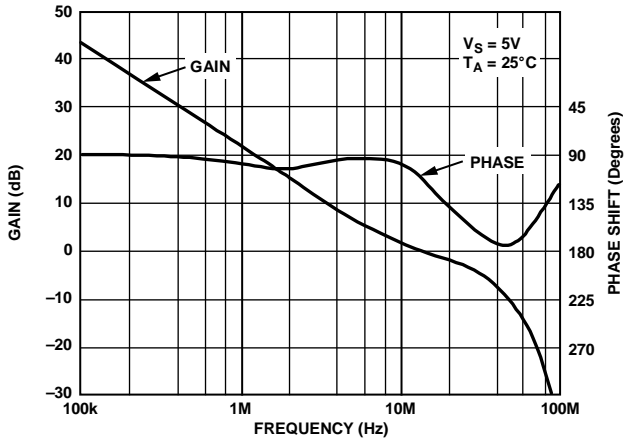


Figure 14. Open-Loop Gain and Phase vs. Frequency (No Load)

09256-019

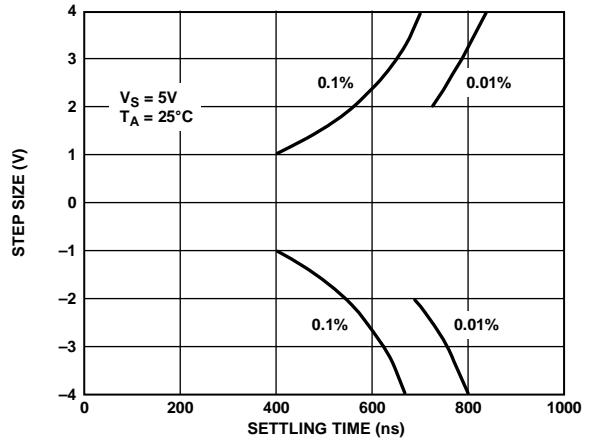


Figure 17. Step Size vs. Settling Time

09256-022

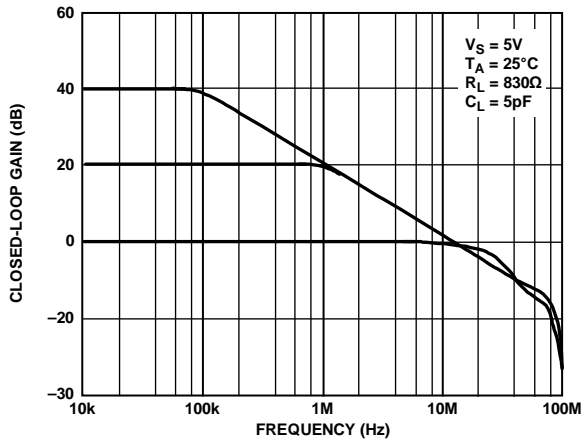


Figure 15. Closed-Loop Gain vs. Frequency

09256-020

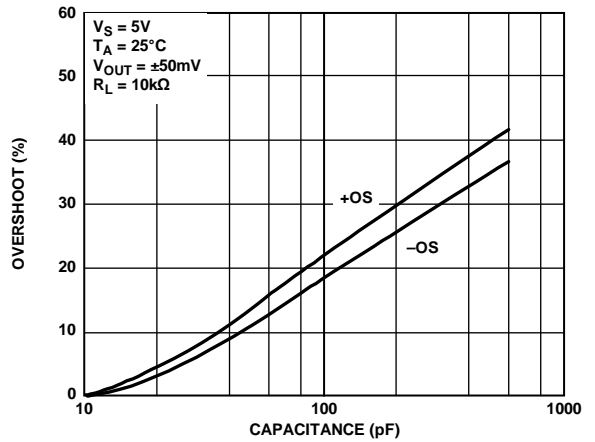


Figure 18. Small-Signal Overshoot vs. Capacitance

09256-023

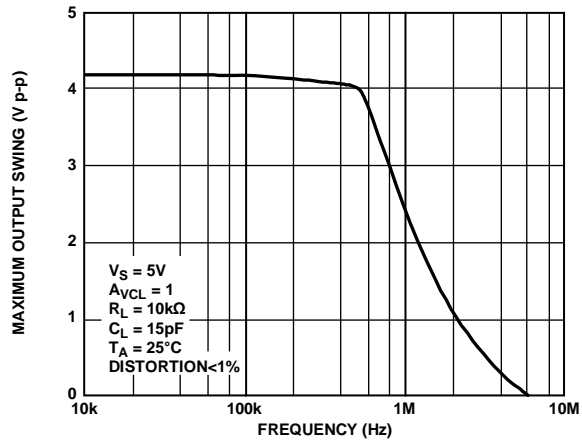


Figure 16. Maximum Output Swing vs. Frequency

09256-021

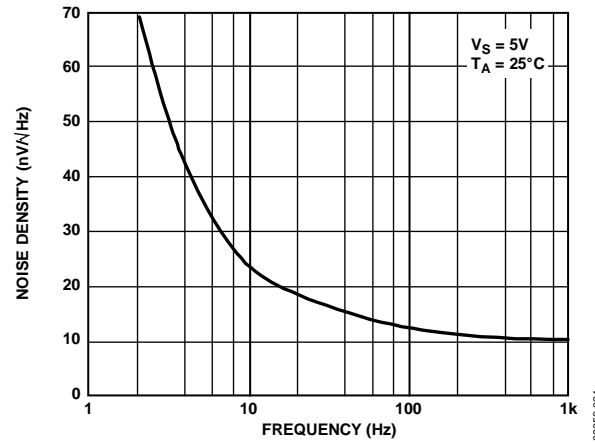


Figure 19. Voltage Noise Density vs. Frequency

09256-024

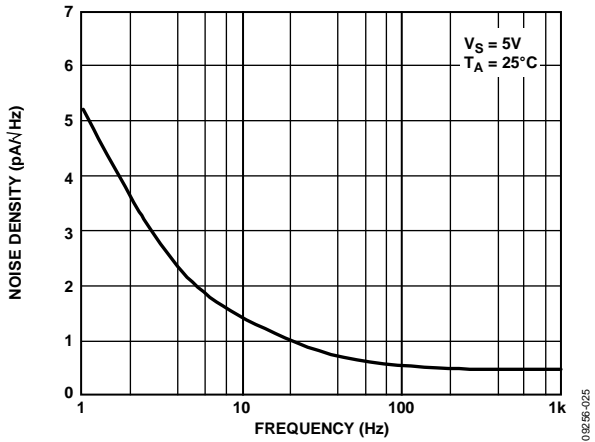


Figure 20. Current Noise Density vs. Frequency

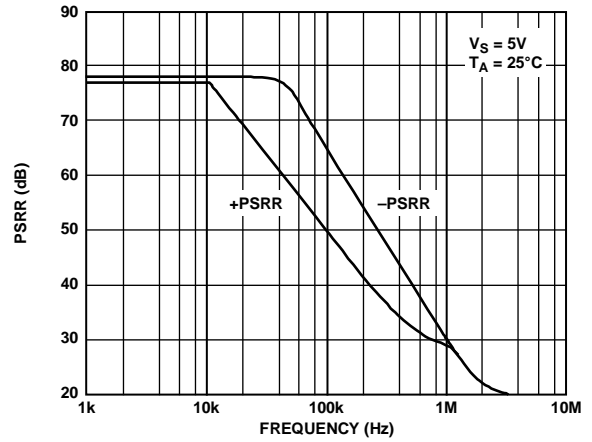


Figure 23. PSRR vs. Frequency

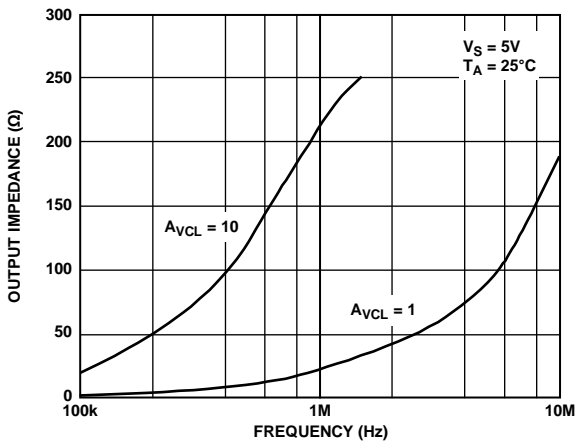


Figure 21. Output Impedance vs. Frequency

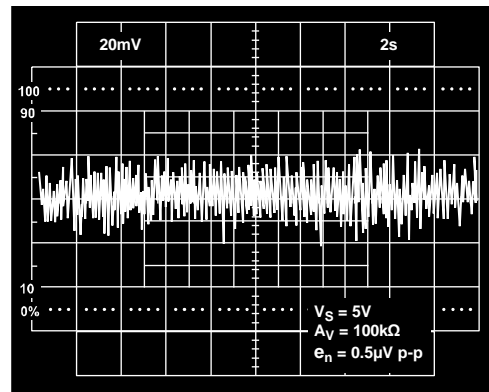


Figure 24. 0.1 Hz to 10 Hz Noise

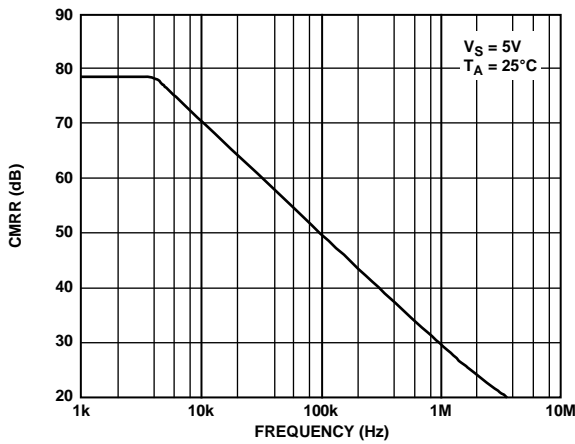


Figure 22. CMRR vs. Frequency

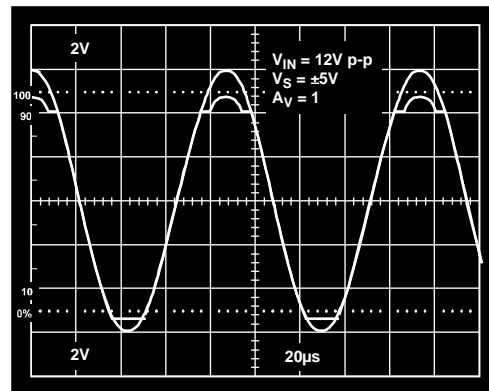
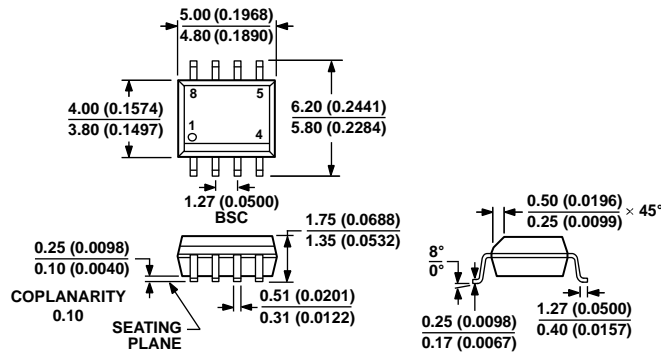


Figure 25. No Phase Reversal ($V_{IN} = 12V$ p-p, $V_S = \pm 5V$, $A_V = 1$)

OUTLINE DIMENSIONS



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.

012607-A

Figure 26. 8-Lead Standard Small Outline Package [SOIC_N]
 Narrow Body
 (R-8)
 Dimensions shown in millimeters and (inches)

ORDERING GUIDE

| Model ¹ | Temperature Range | Package Description | Package Option |
|--------------------|-------------------|------------------------------------------------|----------------|
| OP262TRZ-EP | -55°C to +125°C | 8-Lead Standard Small Outline Package [SOIC_N] | R-8 |
| OP262TRZ-EP-R7 | -55°C to +125°C | 8-Lead Standard Small Outline Package [SOIC_N] | R-8 |

¹ Z = RoHS Compliant Part.

OP262-EP

NOTES

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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