



OPA4243



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Quad OPERATIONAL AMPLIFIER *MicroPOWER, Single-Supply*

FEATURES

- MICRO-SIZE, TSSOP PACKAGE
- SINGLE-SUPPLY OPERATION
- WIDE SUPPLY RANGE: 2.2V to 36V
- LOW QUIESCENT CURRENT: 45 μ A/chan
- WIDE BANDWIDTH: 430kHz
- WIDE INPUT/OUTPUT SWING

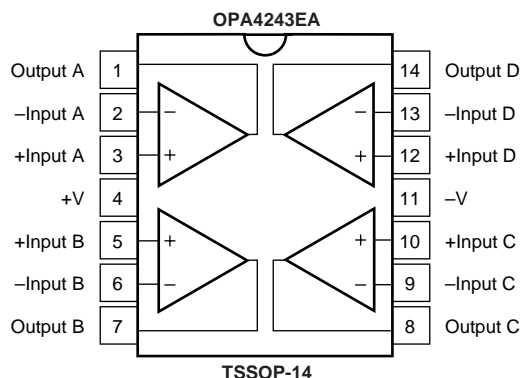
APPLICATIONS

- LCD DISPLAY DRIVERS
- BATTERY POWERED SYSTEMS
- PORTABLE EQUIPMENT
- PCMCIA CARDS
- BATTERY PACKS AND POWER SUPPLIES
- CONSUMER PRODUCTS

DESCRIPTION

The OPA4243 is a four-channel op amp specifically designed for high density, space-limited applications, such as LCD bias drivers, PCMCIA cards, battery-packs and portable instruments. In addition to small size, this part features wide output swing, very low quiescent current, and low bias current. Other features include unity gain stability and the best speed power ratio available. Power supplies in the range of 2.2V to 36V (± 1.1 V to ± 18 V) can be used.

Each channel uses completely independent circuitry for lowest crosstalk and freedom from interaction, even when overloaded. In addition, the amplifier is free from output inversion when the inputs are driven to the rail. The OPA4243EA is supplied in the miniature TSSOP-14 surface mount package. Specifications apply from -40°C to $+85^{\circ}\text{C}$. However, as the extensive typical performance curves indicate, the OPA4243 can be used over the full -55°C to $+125^{\circ}\text{C}$ range. A SPICE macromodel is available for design analysis.



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Twx: 910-952-1111 • Internet: <http://www.burr-brown.com/> • Cable: BBRCORP • Telex: 066-6491 • FAX: (520) 889-1510 • Immediate Product Info: (800) 548-6132

SPECIFICATIONS: $V_S = +2.6V$ to $+36V$

Boldface limits apply over the specified temperature range, $T_A = -40^{\circ}C$ to $+85^{\circ}C$

At $T_A = +25^{\circ}C$, $R_L = 20k\Omega$ connected to ground, unless otherwise noted.

| PARAMETER | CONDITIONS | OPA4243EA | | | UNITS |
|--|---|--------------------------------|--------------------|--------------|-----------------------|
| | | MIN | TYP ⁽¹⁾ | MAX | |
| OFFSET VOLTAGE | | | | | |
| Input Offset Voltage V_{OS} | $V_S = \pm 7.5V$, $V_{CM} = 0$ | | ± 2 | ± 5 | mV |
| Over Temperature | | | | ± 6 | mV |
| vs Temperature dV_{OS}/dT | $T_A = -40^{\circ}C$ to $+85^{\circ}C$ | | ± 2.5 | | $\mu V/^{\circ}C$ |
| vs Power Supply | $V_S = +2.6V$ to $+36V$ | | 2.5 | 100 | $\mu V/V$ |
| Over Temperature | $V_S = +2.6V$ to $+36V$ | | | 100 | $\mu V/V$ |
| Channel Separation | | | 140 | | dB |
| INPUT BIAS CURRENT | | | | | |
| Input Bias Current I_R | $V_{CM} = V_S/2$ | | -10 | -25 | nA |
| Input Offset Current I_{OS} | $V_{CM} = V_S/2$ | | ± 1 | ± 10 | nA |
| NOISE | | | | | |
| Input Noise Voltage, $f = 0.1$ to $10Hz$ | | | 0.4 | | $\mu Vp-p$ |
| Input Noise Voltage Density, $f = 1kHz$ | | | 22 | | nV/\sqrt{Hz} |
| Current Noise Density, $f = 1kHz$ | | | 40 | | fA/\sqrt{Hz} |
| INPUT VOLTAGE RANGE | | | | | |
| Common-Mode Voltage Range V_{CM} | $V_S = \pm 18V$, $V_{CM} = -18V$ to $+17.1V$ | 0 | | $(V+) - 0.9$ | V |
| Common-Mode Rejection $CMRR$ | $V_S = \pm 18V$, $V_{CM} = -18V$ to $+17.1V$ | 82 | 104 | | dB |
| Over Temperature | | 82 | | | dB |
| INPUT IMPEDANCE | | | | | |
| Differential | | | $10^6 \parallel 2$ | | $\Omega \parallel pF$ |
| Common-Mode | | | $10^9 \parallel 2$ | | $\Omega \parallel pF$ |
| OPEN-LOOP GAIN | | | | | |
| Open-Loop Voltage Gain A_{OL} | $V_O = 0.5V$ to $(V+) - 0.9$ | 86 | 104 | | dB |
| Over Temperature | $V_O = 0.5V$ to $(V+) - 0.9$ | 86 | | | dB |
| FREQUENCY RESPONSE | | | | | |
| Gain-Bandwidth Product GBW | $G = 1$ | | 430 | | kHz |
| Slew Rate SR | 10V Step | | $-0.1, \pm 0.16$ | | V/ μs |
| Setting Time, 0.01% | $V_{IN} \bullet \text{Gain} = V_S$ | | 150 | | μs |
| Overload Recovery Time | | | 8 | | μs |
| OUTPUT | | | | | |
| Voltage Output, Positive V_O | $A_{OL} \geq 80dB$, $R_L = 20k\Omega$ to $V_S/2$ | $(V+) - 0.9$ | $(V+) - 0.75$ | | V |
| Over Temperature | $A_{OL} \geq 80dB$, $R_L = 20k\Omega$ to $V_S/2$ | $(V+) - 0.9$ | $(V+) - 0.75$ | | V |
| Voltage Output, Negative | $A_{OL} \geq 80dB$, $R_L = 20k\Omega$ to $V_S/2$ | 0.5 | 0.2 | | V |
| Over Temperature | $A_{OL} \geq 80dB$, $R_L = 20k\Omega$ to $V_S/2$ | 0.5 | 0.2 | | V |
| Voltage Output, Positive | $A_{OL} \geq 80dB$, $R_L = 20k\Omega$ to Ground | | $(V+) - 0.75$ | | V |
| Over Temperature | $A_{OL} \geq 80dB$, $R_L = 20k\Omega$ to Ground | | $(V+) - 0.75$ | | V |
| Voltage Output, Negative | $A_{OL} \geq 80dB$, $R_L = 20k\Omega$ to Ground | | 0.1 | | V |
| Over Temperature | $A_{OL} \geq 80dB$, $R_L = 20k\Omega$ to Ground | | 0.1 | | V |
| Short-Circuit Current I_{SC} | | | -25, +12 | | mA |
| Capacitive Load Drive C_{LOAD} | | | See Typical Curve | | |
| POWER SUPPLY | | | | | |
| Specified Voltage Range V_S | Over Temperature | +2.6 | | +36 | V |
| Minimum Operating Voltage | | | +2.2 | | V |
| Quiescent Current I_O | $I_O = 0$ | | 45 | 60 | μA |
| Over Temperature | $I_O = 0$ | | | 70 | μA |
| TEMPERATURE RANGE | | | | | |
| Specified Range | | -40 | | 85 | $^{\circ}C$ |
| Operating Range | | -55 | | 125 | $^{\circ}C$ |
| Storage Range | | -65 | | 150 | $^{\circ}C$ |
| Thermal Resistance θ_{JA} | | | | | |
| TSSOP-14 Surface Mount | | | 100 | | $^{\circ}C/W$ |

NOTE: (1) $V_S = +15V$.

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

| | |
|---|----------------------------|
| Supply Voltage, V+ to V- | 36V |
| Input Voltage Range ⁽²⁾ | (V-) - 0.3V to (V+) + 0.3V |
| Input Current ⁽²⁾ | 10mA |
| Output Short-Circuit ⁽³⁾ | Continuous |
| Operating Temperature | -55°C to +125°C |
| Storage Temperature | -65°C to +150°C |
| Junction Temperature | 150°C |
| Lead Temperature (soldering, 10s) | 300°C |
| ESD Capability | 2000V |

NOTES: (1) Stresses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. (2) Inputs are diode-clamped to the supply rails and should be current-limited to 10mA or less if input voltages can exceed rails by more than 0.3V. (3) 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.

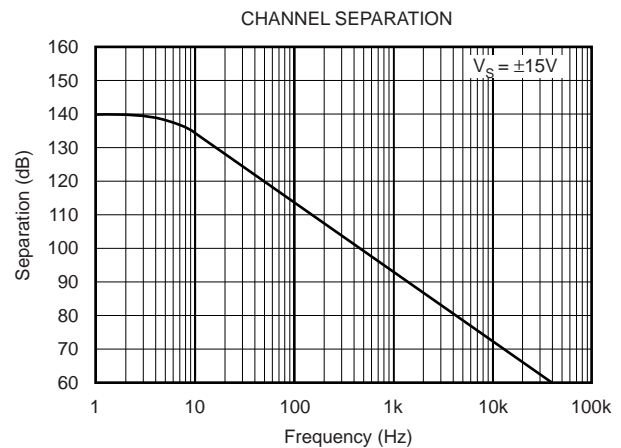
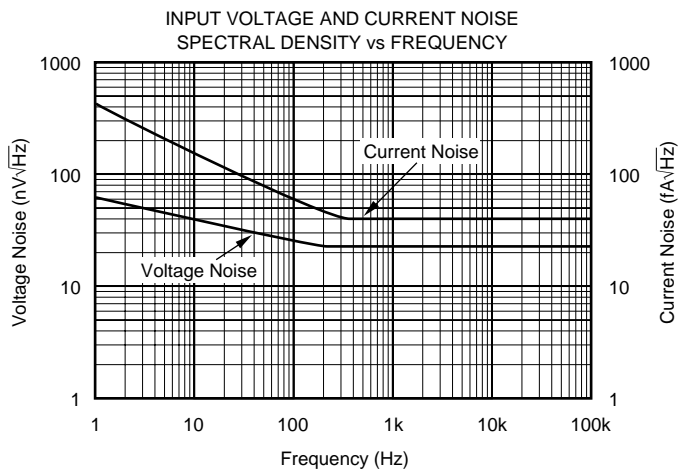
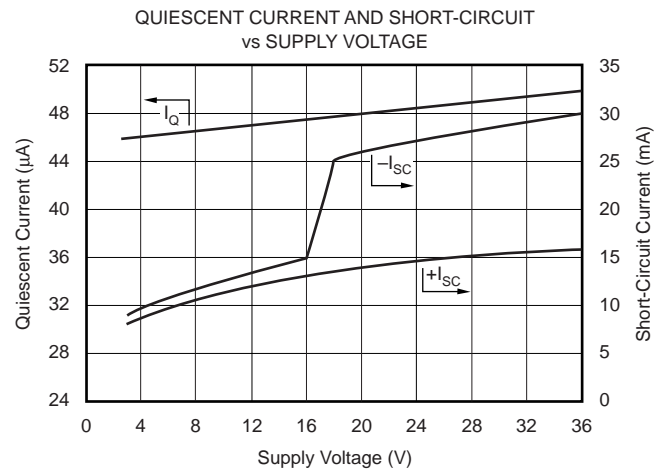
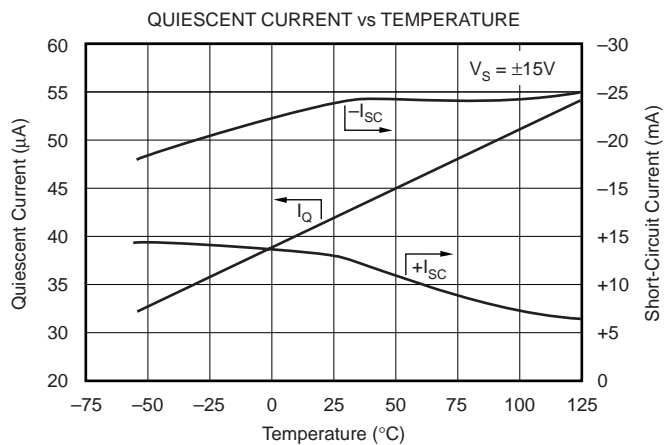
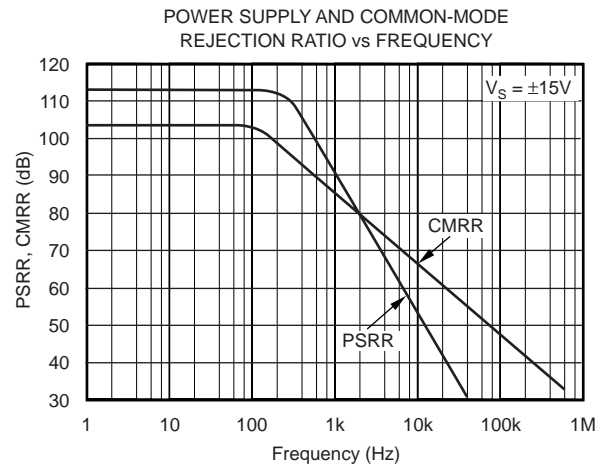
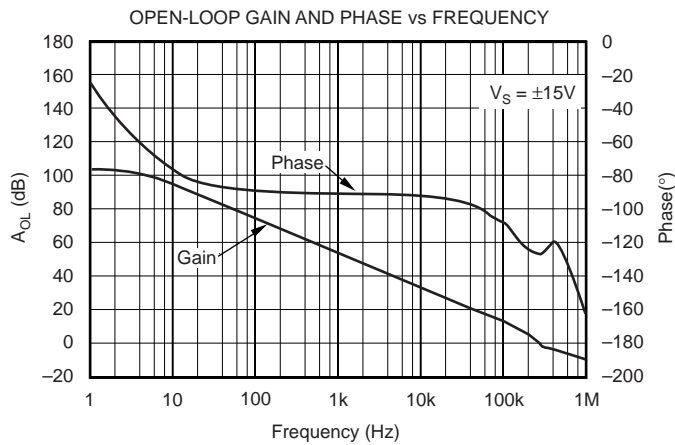
PACKAGE/ORDERING INFORMATION

| PRODUCT | PACKAGE | PACKAGE DRAWING NUMBER | SPECIFIED TEMPERATURE RANGE | PACKAGE MARKING | ORDERING NUMBER ⁽¹⁾ | TRANSPORT MEDIA |
|----------------|---------------|------------------------|-----------------------------|-----------------|--------------------------------|--------------------------------|
| OPA4243EA " | TSSOP-14 " | 357 " | -40°C to +85°C " | OPA4243EA " | OPA4243EA/250 OPA4243EA/2K5 | Tape and Reel Tape and Reel |

NOTE: (1) Models with a slash (/) are available only in Tape and Reel in the quantities indicated (e.g., /2K5 indicates 2500 devices per reel). Ordering 2500 pieces of "OPA4243EA" will get a single 2500-piece Tape and Reel.

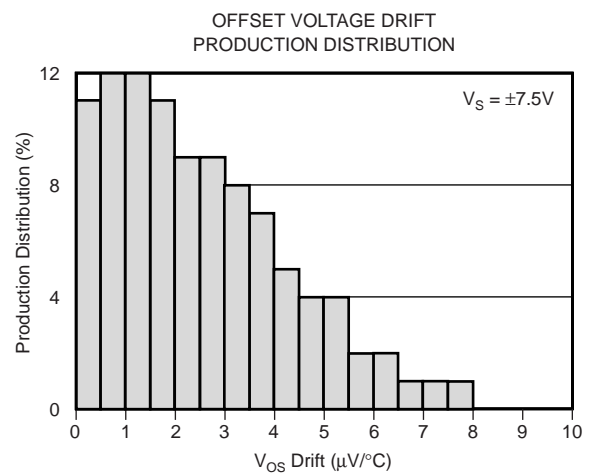
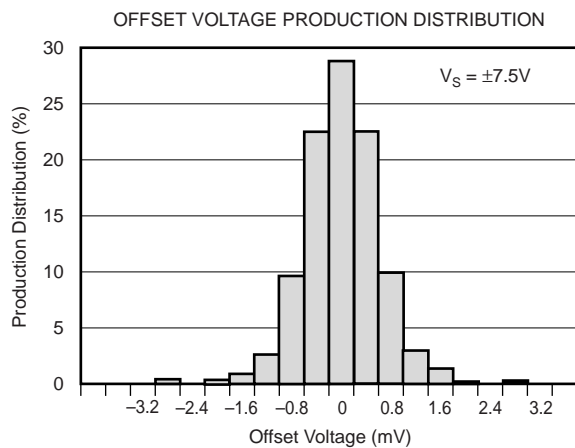
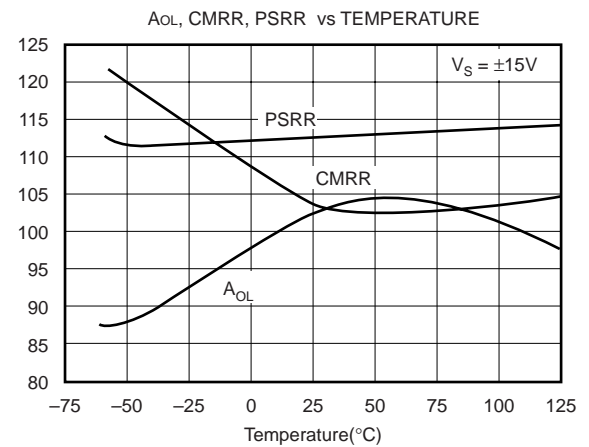
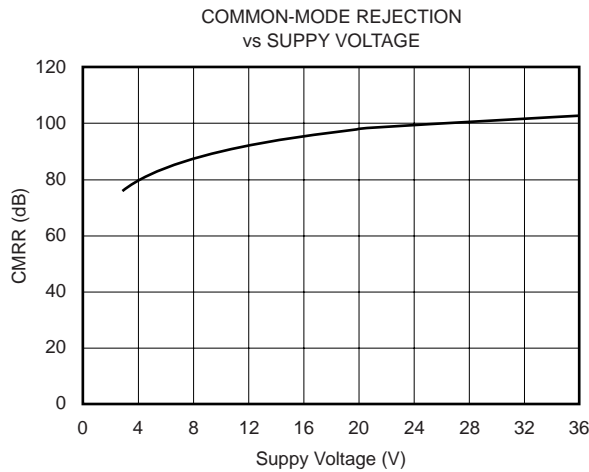
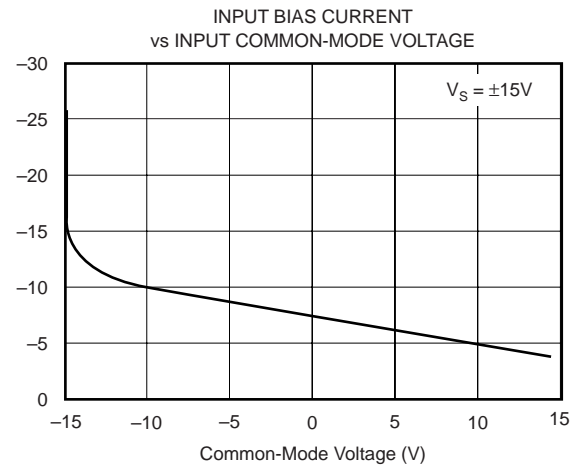
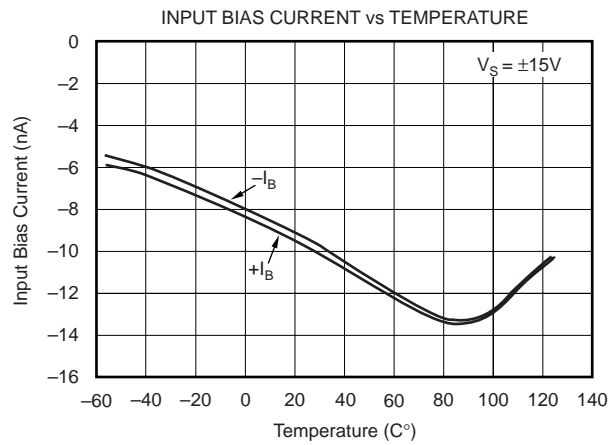
TYPICAL PERFORMANCE CURVES

At $T_A = +25^\circ\text{C}$, $R_L = 20\text{k}\Omega$ connected to ground, unless otherwise noted.



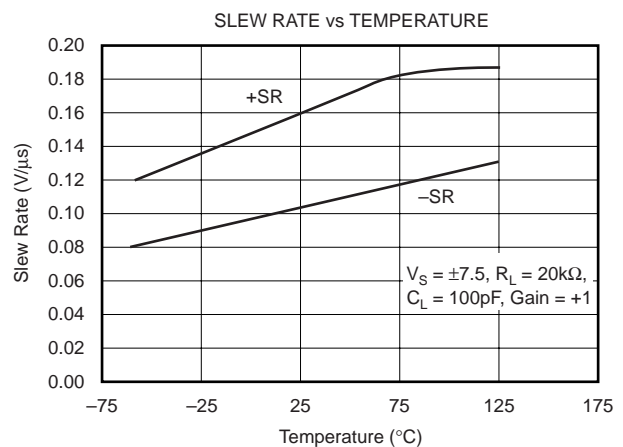
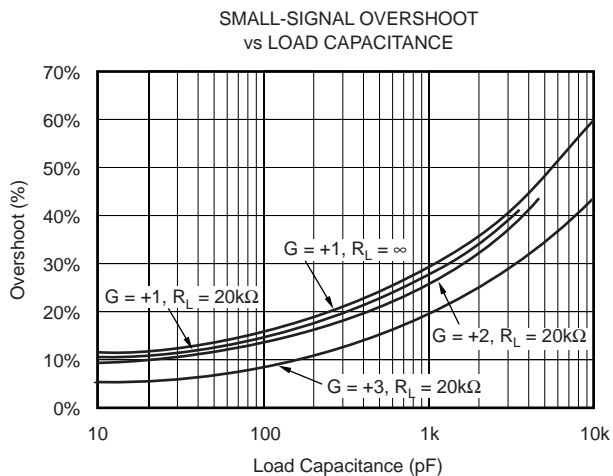
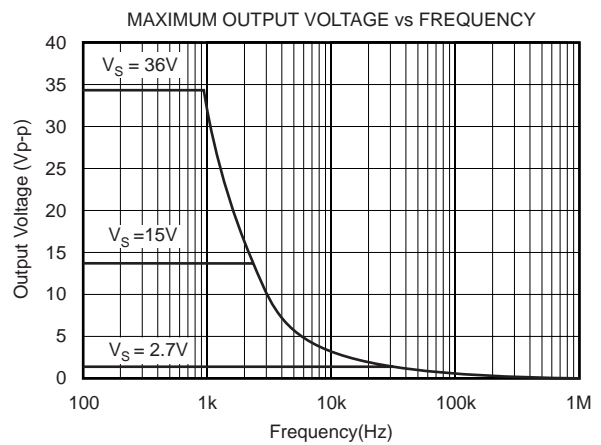
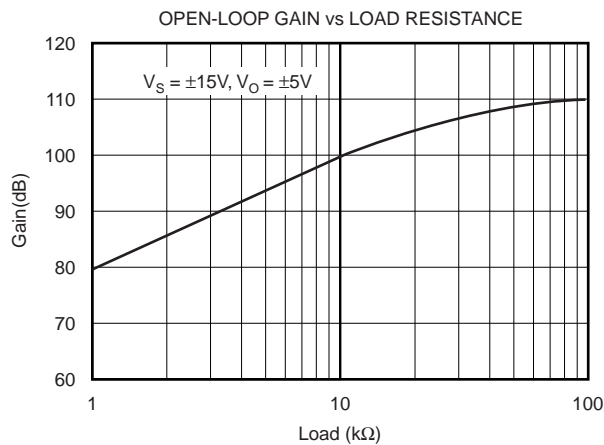
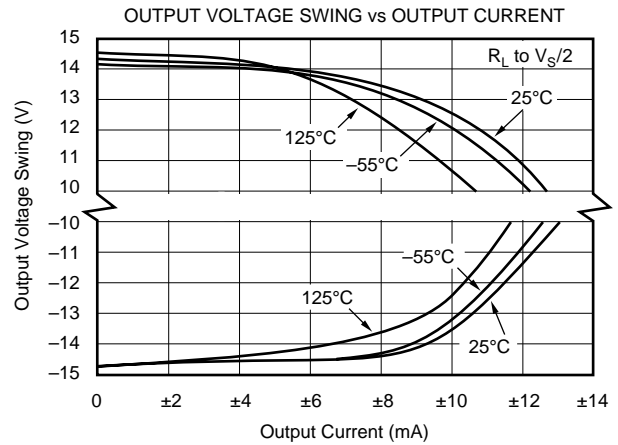
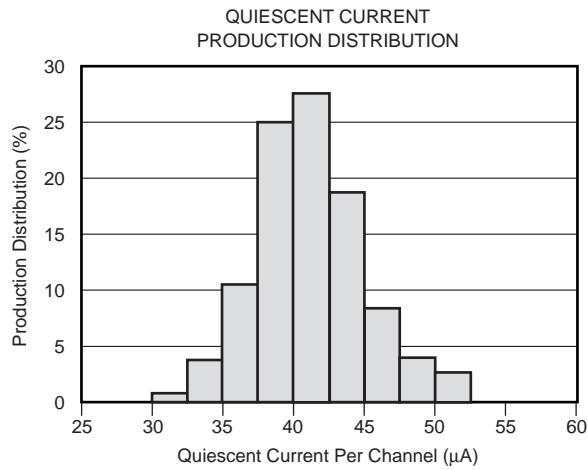
TYPICAL PERFORMANCE CURVES (Cont.)

At $T_A = +25^\circ\text{C}$, $R_L = 20\text{k}\Omega$ connected to ground, unless otherwise noted.



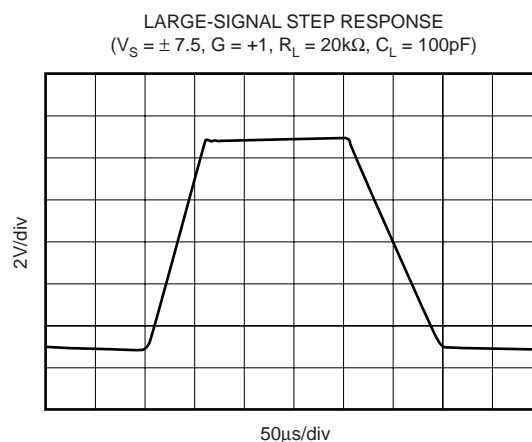
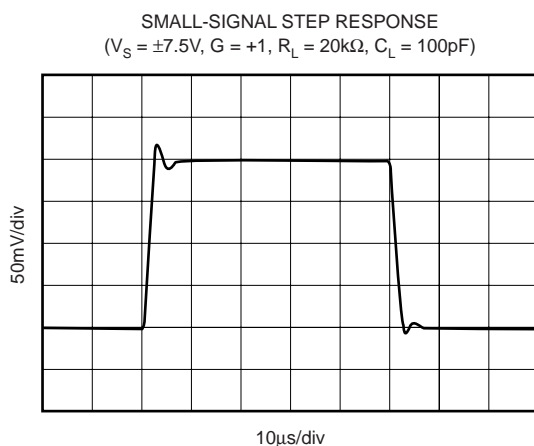
TYPICAL PERFORMANCE CURVES (Cont.)

At $T_A = +25^\circ\text{C}$, $R_L = 20\text{k}\Omega$ connected to ground, unless otherwise noted.



TYPICAL PERFORMANCE CURVES (Cont.)

At $T_A = +25^\circ\text{C}$, $R_L = 20\text{k}\Omega$ connected to ground, unless otherwise noted.



APPLICATION INFORMATION

The OPA4243 is unity-gain stable and suitable for a wide range of general-purpose applications. The power supply pins should be bypassed with $0.01\mu\text{F}$ ceramic capacitors.

OPERATING VOLTAGE

The OPA4243 can operate from single supply (2.2V to 36V) or dual supplies ($\pm 1.1\text{V}$ to $\pm 18\text{V}$) with excellent performance. Unlike most op amps which are specified at only one supply voltage, the OPA4243 is specified for real world applications; a single set of specifications applies throughout the 2.6V to 36V supply range. This allows the designer to have the same assured performance at any supply voltage within this range.

In addition, many key parameters are guaranteed over the specified temperature range, -40°C to $+85^\circ\text{C}$. Most behaviors remain unchanged throughout the full operating voltage range. Parameters, which vary significantly with operating voltage or temperature, are shown in the typical performance curves.

PRINTED CIRCUIT BOARD LAYOUT

See Burr-Brown Application Note AB-132 for specific PC board layout recommendations.

INPUT PROTECTION

Rail-to-rail input signals will not cause damage or invert the output of the OPA4243. To protect against ESD and excessive input voltage (beyond the supply rails) the OPA4243 includes diodes from the input terminals to the power supply rails. Normally, these diodes are reversed biased and have negligible effect on circuit operation. However, if the input voltage is allowed to exceed the supply voltages by enough to forward bias these diodes (generally, 0.3V to 0.6V) excessive input current could flow. If this condition could occur (for example, if an input signal is applied when the op amp supply voltage is zero), care should be taken to limit the input current to less than 10mA to avoid damage. An input signal beyond the supplies, with power applied, can cause an unexpected output inversion.

PACKAGING INFORMATION

| Orderable part number | Status (1) | Material type (2) | Package Pins | Package qty Carrier | RoHS (3) | Lead finish/ Ball material (4) | MSL rating/ Peak reflow (5) | Op temp (°C) | Part marking (6) |
|-------------------------------|---------------|----------------------|-----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------|
| OPA4243EA/250 | Obsolete | Production | TSSOP (PW) 14 | - | - | Call TI | Call TI | -40 to 85 | OPA 4243EA |
| OPA4243EA/2K5 | Active | Production | TSSOP (PW) 14 | 2500 LARGE T&R | Yes | NIPDAU | Level-3-260C-168 HR | -40 to 85 | OPA 4243EA |
| OPA4243EA/2K5.A | Active | Production | TSSOP (PW) 14 | 2500 LARGE T&R | Yes | NIPDAU | Level-3-260C-168 HR | -40 to 85 | OPA 4243EA |

(1) **Status:** For more details on status, see our [product life cycle](#).

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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TAPE AND REEL INFORMATION



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|---------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| OPA4243EA/2K5 | TSSOP | PW | 14 | 2500 | 330.0 | 12.4 | 6.9 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---------------|--------------|-----------------|------|------|-------------|------------|-------------|
| OPA4243EA/2K5 | TSSOP | PW | 14 | 2500 | 353.0 | 353.0 | 32.0 |

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