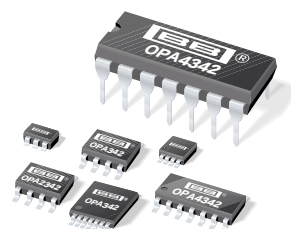




Burr-Brown Products  
from Texas Instruments



OPA342  
OPA2342  
OPA4342

www.ti.com

## Low-Cost, Low-Power, Rail-to-Rail OPERATIONAL AMPLIFIERS

### *MicroAmplifier™* Series

#### FEATURES

- LOW QUIESCENT CURRENT: 150 $\mu$ A typ
- RAIL-TO-RAIL INPUT
- RAIL-TO-RAIL OUTPUT (within 1mV)
- SINGLE SUPPLY CAPABILITY
- LOW COST
- *MicroSIZE* PACKAGE OPTIONS:
  - SOT23-5
  - MSOP-8
  - TSSOP-14
- BANDWIDTH: 1MHz
- SLEW RATE: 1V/ $\mu$ s
- THD + NOISE: 0.006%

#### APPLICATIONS

- COMMUNICATIONS
- PCMCIA CARDS
- DATA ACQUISITION
- PROCESS CONTROL
- AUDIO PROCESSING
- ACTIVE FILTERS
- TEST EQUIPMENT
- CONSUMER ELECTRONICS

#### DESCRIPTION

The OPA342 series rail-to-rail CMOS operational amplifiers are designed for low-cost, low-power, miniature applications. They are optimized to operate on a single supply as low as 2.5V with an input common-mode voltage range that extends 300mV beyond the supplies.

Rail-to-rail input/output and high-speed operation make them ideal for driving sampling Analog-to-Digital Converters (ADC). They are also well suited for general-purpose and audio applications and providing I/V conversion at the output of Digital-to-Analog Converters (DAC). Single, dual, and quad versions have identical specs for design flexibility.

The OPA342 series offers excellent dynamic response with a quiescent current of only 250 $\mu$ A max. Dual and quad designs feature completely independent circuitry for lowest crosstalk and freedom from interaction.

| PACKAGE  | SINGLE<br>OPA342 | DUAL<br>OPA2342 | QUAD<br>OPA4342 |
|----------|------------------|-----------------|-----------------|
| SOT23-5  | ✓                |                 |                 |
| MSOP-8   |                  | ✓               |                 |
| SO-8     | ✓                | ✓               |                 |
| TSSOP-14 |                  |                 | ✓               |
| SO-14    |                  |                 | ✓               |
| DIP-14   |                  |                 | ✓               |

SPICE MODEL available at [www.burr-brown.com](http://www.burr-brown.com).



# SPECIFICATIONS: $V_S = 2.7V$ to $5.5V$

At  $T_A = +25^\circ C$ ,  $R_L = 10k\Omega$  connected to  $V_S/2$  and  $V_{OUT} = V_S/2$ , unless otherwise noted.

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

| PARAMETER                                                                                                                                                                                                                                                                    | CONDITION                            | OPA342NA, UA<br>OPA2342EA, UA<br>OPA4342EA, UA, PA                                                                                                                                                                                                                                                                                                                           |                                                                         |                                                               | UNITS                                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                              |                                      | MIN                                                                                                                                                                                                                                                                                                                                                                          | TYP                                                                     | MAX                                                           |                                                                                                                                        |
| <b>OFFSET VOLTAGE</b><br>Input Offset Voltage<br>$T_A = -40^\circ C$ to $+85^\circ C$<br><b>vs Temperature</b><br>vs Power Supply<br>$T_A = -40^\circ C$ to $+85^\circ C$<br>Channel Separation, dc<br>$f = 1kHz$                                                            | $V_{OS}$<br><br>$dV_{OS}/dT$<br>PSRR | $V_{CM} = V_S/2$<br><br>$V_S = 2.7V$ to $5.5V$ , $V_{CM} < (V+) - 1.8V$<br><b><math>V_S = 2.7V</math> to <math>5.5V</math>, <math>V_{CM} &lt; (V+) - 1.8V</math></b>                                                                                                                                                                                                         | $\pm 1$<br><b><math>\pm 1</math></b><br>$\pm 3$<br>30<br><br>0.2<br>132 | $\pm 6$<br><b><math>\pm 6</math></b><br><br>200<br><b>250</b> | mV<br><b>mV</b><br>$\mu V/^\circ C$<br>$\mu V/V$<br><b><math>\mu V/V</math></b><br>$\mu V/V$<br>dB                                     |
| <b>INPUT BIAS CURRENT</b><br>Input Bias Current<br>$T_A = -40^\circ C$ to $+85^\circ C$<br>Input Offset Current                                                                                                                                                              | $I_B$<br><br>$I_{OS}$                | <b>See Typical Curve</b>                                                                                                                                                                                                                                                                                                                                                     |                                                                         |                                                               | pA<br><b>pA</b><br>pA                                                                                                                  |
| <b>NOISE</b><br>Input Voltage Noise, $f = 0.1Hz$ to $50kHz$<br>Input Voltage Noise Density, $f = 1kHz$<br>Current Noise Density, $f = 1kHz$                                                                                                                                  | <br>$e_n$<br>$i_n$                   |                                                                                                                                                                                                                                                                                                                                                                              | 8<br>30<br>0.5                                                          |                                                               | $\mu V_{rms}$<br>$nV/\sqrt{Hz}$<br>$fA/\sqrt{Hz}$                                                                                      |
| <b>INPUT VOLTAGE RANGE</b><br>Common-Mode Voltage Range<br>Common-Mode Rejection Ratio<br>$T_A = -40^\circ C$ to $+85^\circ C$<br>Common-Mode Rejection Ratio<br>$T_A = -40^\circ C$ to $+85^\circ C$<br>Common-Mode Rejection Ratio<br>$T_A = -40^\circ C$ to $+85^\circ C$ | $V_{CM}$<br>CMRR<br>CMRR<br>CMRR     | $V_S = +5.5V$ , $-0.3V < V_{CM} < (V+) - 1.8$<br><b><math>V_S = +5.5V</math>, <math>-0.3V &lt; V_{CM} &lt; (V+) - 1.8</math></b><br>$V_S = +5.5V$ , $-0.3V < V_{CM} < 5.8V$<br><b><math>V_S = +5.5V</math>, <math>-0.3V &lt; V_{CM} &lt; 5.8V</math></b><br>$V_S = +2.7V$ , $-0.3V < V_{CM} < 3V$<br><b><math>V_S = +2.7V</math>, <math>-0.3V &lt; V_{CM} &lt; 3V</math></b> | -0.3<br>76<br><b>74</b><br>66<br><b>64</b><br>62<br><b>60</b>           | $(V+) + 0.3$                                                  | V<br>dB<br><b>dB</b><br>dB<br><b>dB</b><br>dB<br><b>dB</b>                                                                             |
| <b>INPUT IMPEDANCE</b><br>Differential<br>Common-Mode                                                                                                                                                                                                                        |                                      |                                                                                                                                                                                                                                                                                                                                                                              | $10^{13} \parallel 3$<br>$10^{13} \parallel 6$                          |                                                               | $\Omega \parallel pF$<br>$\Omega \parallel pF$                                                                                         |
| <b>OPEN-LOOP GAIN</b><br>Open-Loop Voltage Gain<br>$T_A = -40^\circ C$ to $+85^\circ C$<br><br>$T_A = -40^\circ C$ to $+85^\circ C$                                                                                                                                          | $A_{OL}$                             | $R_L = 100k\Omega$ , $10mV < V_O < (V+) - 10mV$<br><b><math>R_L = 100k\Omega</math>, <math>10mV &lt; V_O &lt; (V+) - 10mV</math></b><br>$R_L = 5k\Omega$ , $400mV < V_O < (V+) - 400mV$<br><b><math>R_L = 5k\Omega</math>, <math>400mV &lt; V_O &lt; (V+) - 400mV</math></b>                                                                                                 | 104<br><b>100</b><br>96<br><b>90</b>                                    | 124<br><br>114                                                | dB<br><b>dB</b><br>dB<br><b>dB</b>                                                                                                     |
| <b>FREQUENCY RESPONSE</b><br>Gain-Bandwidth Product<br>Slew Rate<br>Settling Time, 0.1%<br>0.01%<br>Overload Recovery Time<br>Total Harmonic Distortion + Noise, $f = 1kHz$ THD+N                                                                                            | GBW<br>SR                            | $C_L = 100pF$<br>$G = 1$<br><br>$V_S = 5.5V$ , 2V Step<br>$V_S = 5.5V$ , 2V Step<br>$V_{IN} \cdot G = V_S$<br>$V_S = 5.5V$ , $V_O = 3Vp-p^{(1)}$ , $G = 1$                                                                                                                                                                                                                   | 1<br>1<br>5<br>8<br>2.5<br>0.006                                        |                                                               | MHz<br>V/ $\mu s$<br>$\mu s$<br>$\mu s$<br>$\mu s$<br>%                                                                                |
| <b>OUTPUT</b><br>Voltage Output Swing from Rail <sup>(2)</sup><br><br>$T_A = -40^\circ C$ to $+85^\circ C$<br><br>$T_A = -40^\circ C$ to $+85^\circ C$<br>Short-Circuit Current<br>Capacitive Load Drive                                                                     | <br><br><br>$I_{SC}$<br>$C_{LOAD}$   | $R_L = 100k\Omega$ , $A_{OL} \geq 96dB$<br>$R_L = 100k\Omega$ , $A_{OL} \geq 104dB$<br><b><math>R_L = 100k\Omega</math>, <math>A_{OL} \geq 100dB</math></b><br>$R_L = 5k\Omega$ , $A_{OL} \geq 96dB$<br><b><math>R_L = 5k\Omega</math>, <math>A_{OL} \geq 90dB</math></b><br>Per Channel                                                                                     | 1<br>3<br><br>20<br><br>$\pm 15$                                        | 10<br><b>10</b><br>400<br><b>400</b>                          | mV<br>mV<br><b>mV</b><br>mV<br><b>mV</b><br>mA                                                                                         |
| <b>POWER SUPPLY</b><br>Specified Voltage Range<br>Operating Voltage Range<br>Quiescent Current (per amplifier)<br>$T_A = -40^\circ C$ to $+85^\circ C$                                                                                                                       | $V_S$<br><br>$I_Q$                   | $I_O = 0A$                                                                                                                                                                                                                                                                                                                                                                   | 2.7<br><br>2.5 to 5.5<br>150                                            | 5.5<br><br>250<br><b>300</b>                                  | V<br>V<br>$\mu A$<br><b><math>\mu A</math></b>                                                                                         |
| <b>TEMPERATURE RANGE</b><br>Specified Range<br>Operating Range<br>Storage Range<br>Thermal Resistance<br>SOT23-5 Surface Mount<br>MSOP-8 Surface Mount<br>SO-8 Surface Mount<br>TSSOP-14 Surface Mount<br>SO-14 Surface Mount<br>DIP-14                                      | <br><br><br>$\theta_{JA}$            |                                                                                                                                                                                                                                                                                                                                                                              | -40<br>-55<br>-65<br><br>200<br>150<br>150<br>100<br>100<br>100         | +85<br>+125<br>+150                                           | $^\circ C$<br>$^\circ C$<br>$^\circ C$<br>$^\circ C/W$<br>$^\circ C/W$<br>$^\circ C/W$<br>$^\circ C/W$<br>$^\circ C/W$<br>$^\circ C/W$ |

NOTES: (1)  $V_{OUT} = 0.25V$  to  $3.25V$ . (2) Output voltage swings are measured between the output and power-supply rails.

## ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

|                                                      |                          |
|------------------------------------------------------|--------------------------|
| Supply Voltage, V+ to V- .....                       | 7.5V                     |
| Signal Input Terminals, Voltage <sup>(2)</sup> ..... | (V-) -0.5V to (V+) +0.5V |
| Current <sup>(2)</sup> .....                         | 10mA                     |
| Output Short-Circuit <sup>(3)</sup> .....            | 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 Tolerance (Human Body Model) .....               | 4000V                    |

NOTES: (1) Stresses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. These are stress ratings only. Functional operation of the device at these conditions, or beyond the specified operating conditions, is not implied. (2) Input terminals are diode-clamped to the power supply rails. Input signals that can swing more than 0.5V beyond the supply rails should be current-limited to 10mA or less. (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.

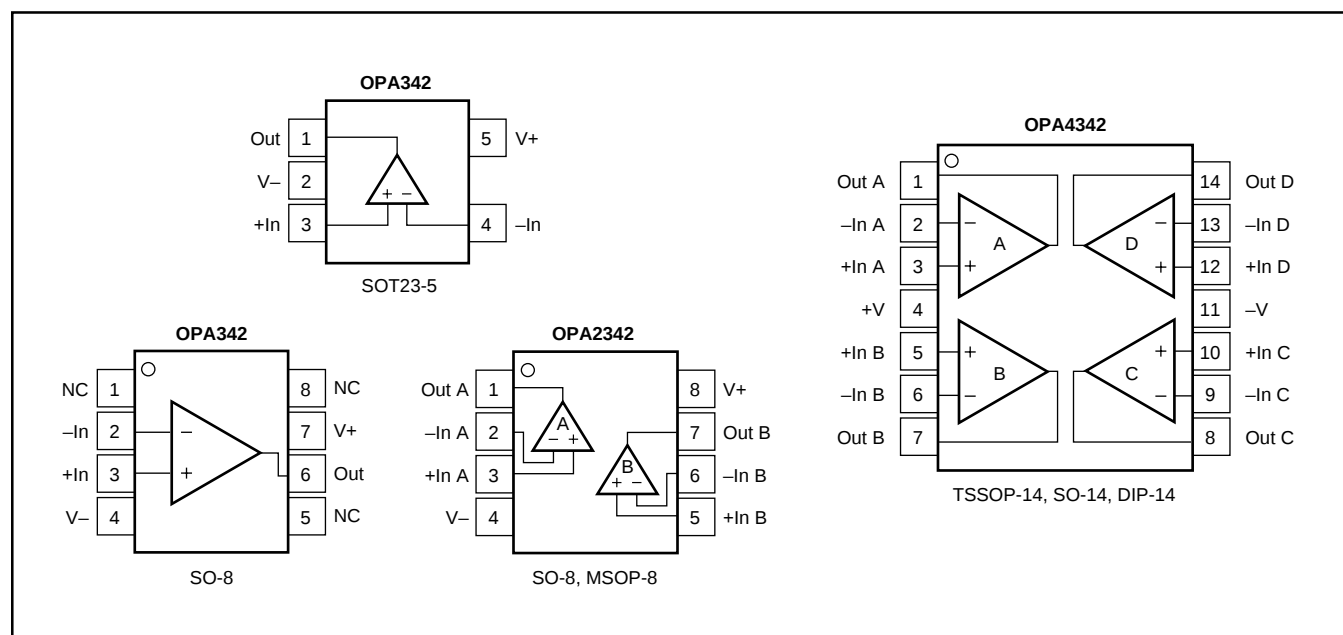
ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

## PACKAGE/ORDERING INFORMATION

| PRODUCT        | PACKAGE       | PACKAGE DRAWING NUMBER | SPECIFIED TEMPERATURE RANGE | PACKAGE MARKING | ORDERING NUMBER <sup>(1)</sup>                                            | TRANSPORT MEDIA                                                   |
|----------------|---------------|------------------------|-----------------------------|-----------------|---------------------------------------------------------------------------|-------------------------------------------------------------------|
| OPA342NA<br>"  | SOT23-5<br>"  | 331<br>"               | -40°C to +85°C<br>"         | B42<br>"        | OPA342NA/250<br>OPA342NA/3K<br>OPA342UA<br>OPA342UA/2K5                   | Tape and Reel<br>Tape and Reel<br>Rails<br>Tape and Reel          |
| OPA2342EA<br>" | MSOP-8<br>"   | 337<br>"               | -40°C to +85°C<br>"         | C42<br>"        | OPA2342EA/250<br>OPA2342EA/2K5<br>OPA2342UA<br>OPA2342UA/2K5              | Tape and Reel<br>Tape and Reel<br>Rails<br>Tape and Reel          |
| OPA4342EA<br>" | TSSOP-14<br>" | 357<br>"               | -40°C to +85°C<br>"         | OPA4342EA<br>"  | OPA4342EA/250<br>OPA4342EA/2K5<br>OPA4342UA<br>OPA4342UA/2K5<br>OPA4342PA | Tape and Reel<br>Tape and Reel<br>Rails<br>Tape and Reel<br>Rails |
| OPA4342UA<br>" | SO-14<br>"    | 235<br>"               | -40°C to +85°C<br>"         | OPA4342UA<br>"  |                                                                           |                                                                   |
| OPA4342PA      | DIP-14        | 010                    | -40°C to +85°C              | OPA4342PA       |                                                                           |                                                                   |

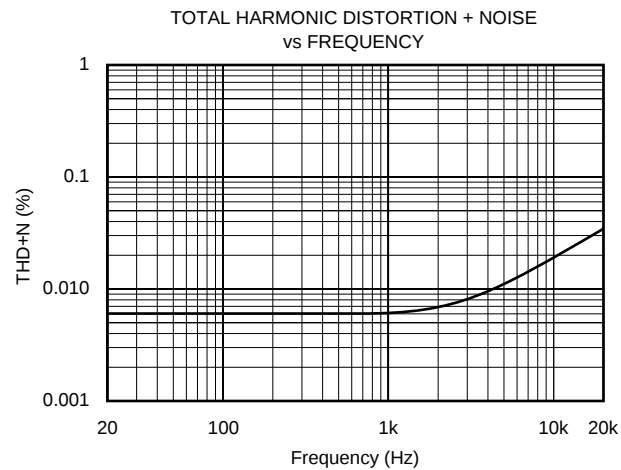
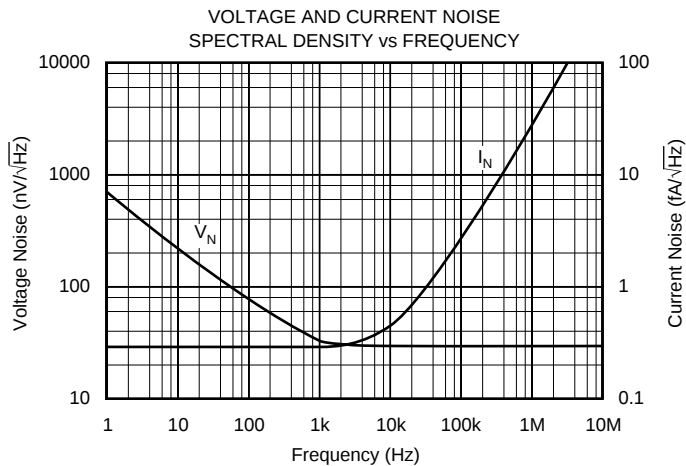
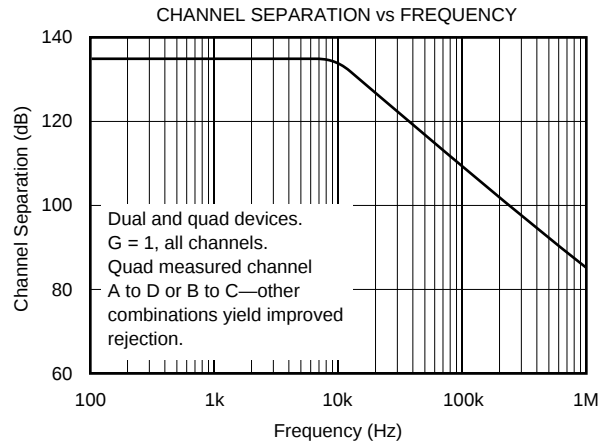
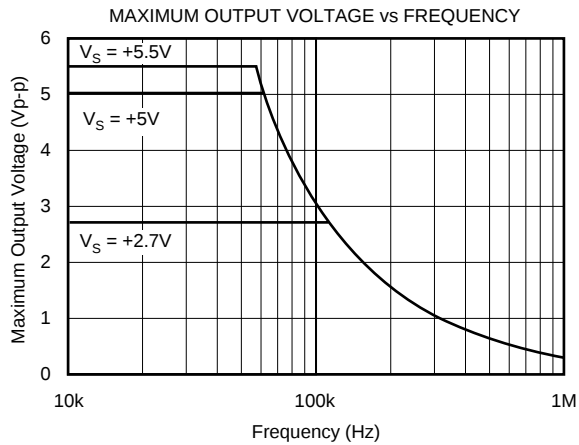
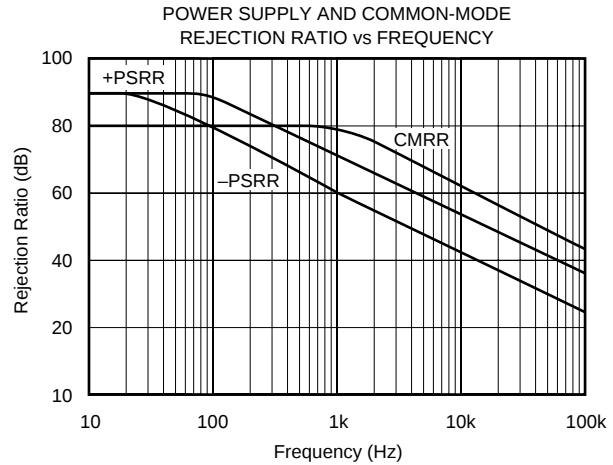
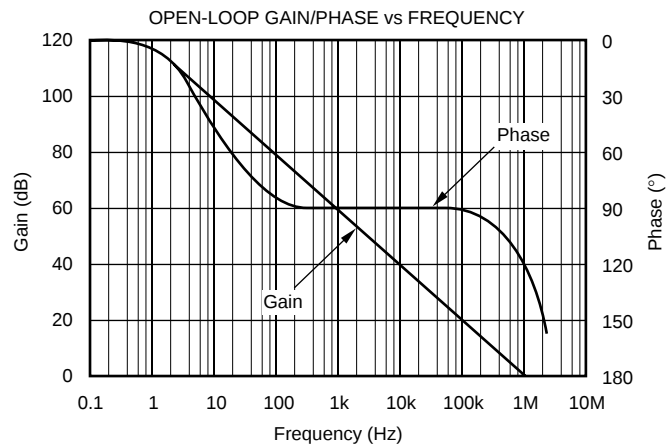
NOTE: (1) Models with a slash (/) are available only in Tape and Reel in the quantities indicated (e.g., /3K indicates 3000 devices per reel). Ordering 3000 pieces of "OPA342NA/3K" will get a single 3000-piece Tape and Reel.

## PIN CONFIGURATIONS



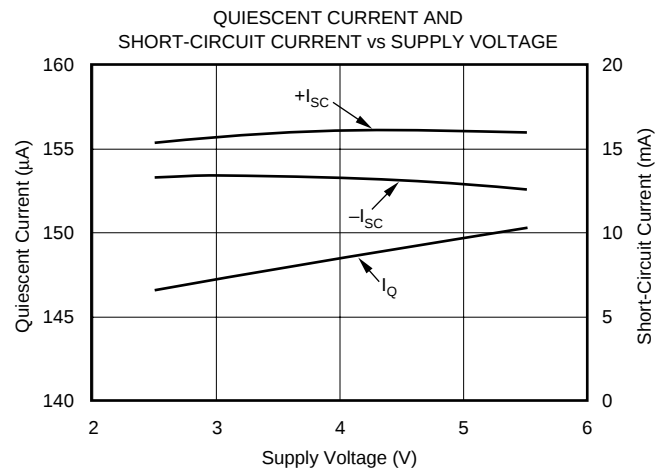
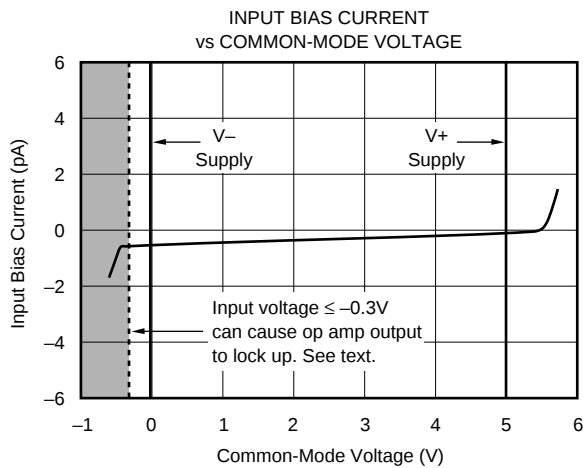
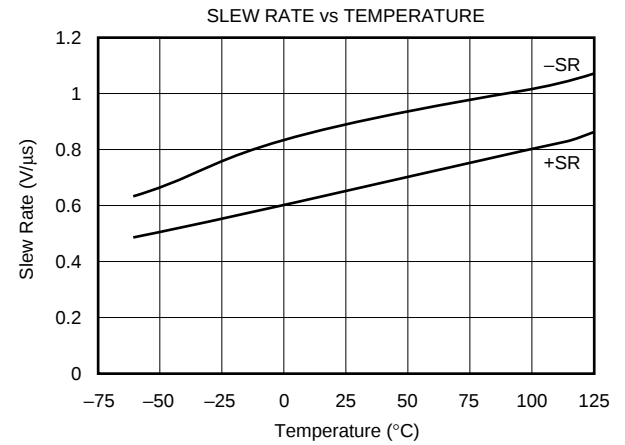
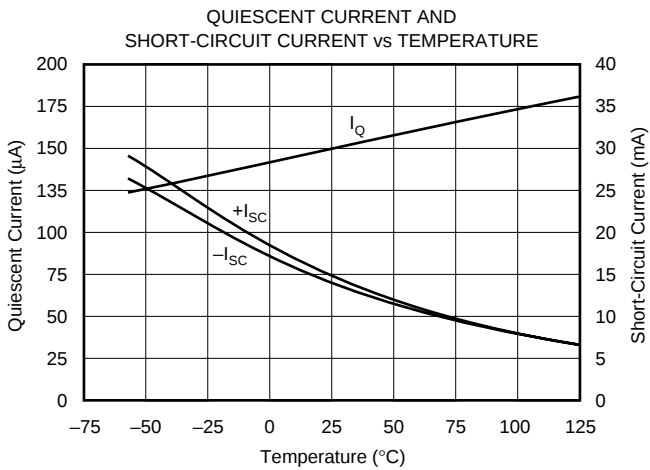
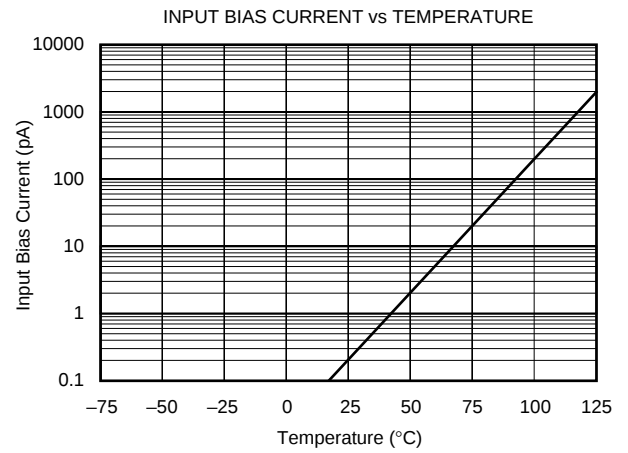
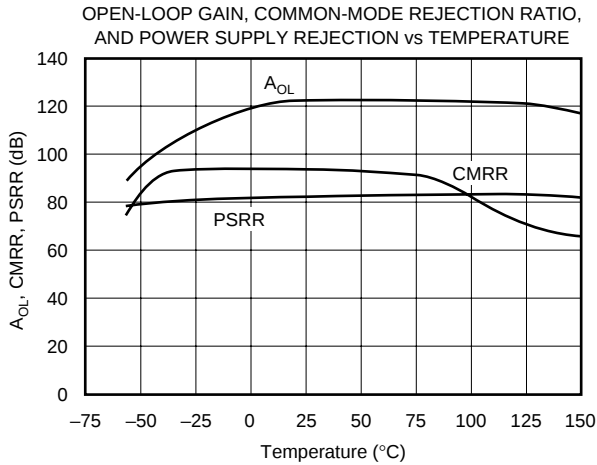
# TYPICAL PERFORMANCE CURVES

At  $T_A = +25^\circ\text{C}$ ,  $V_S = +5\text{V}$ , and  $R_L = 10\text{k}\Omega$  connected to  $V_S/2$ , unless otherwise noted.



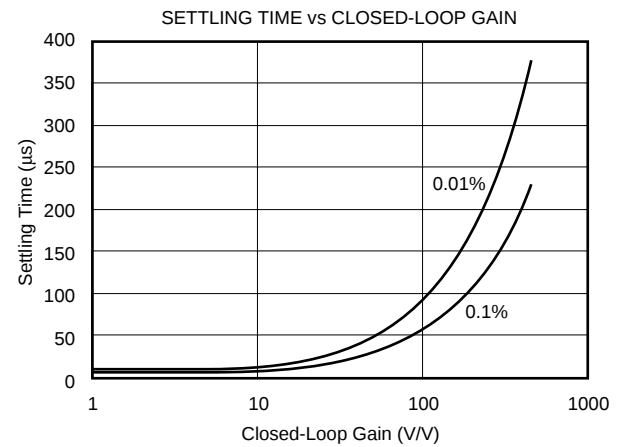
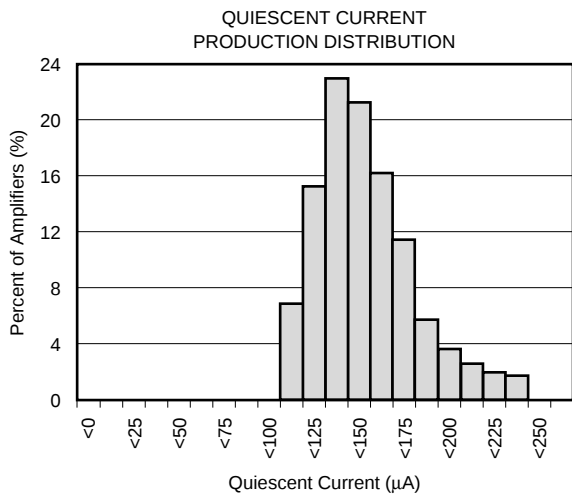
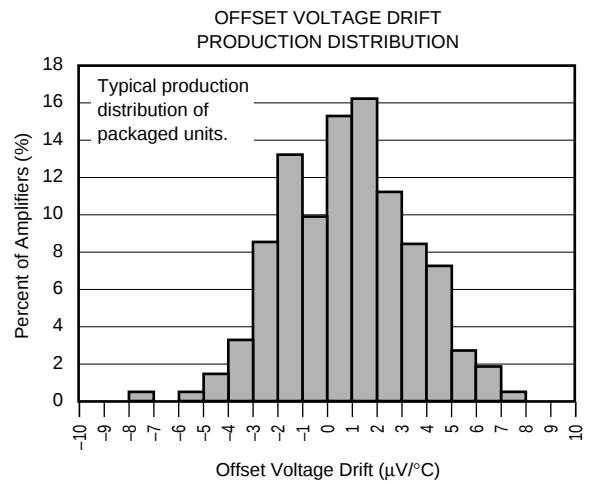
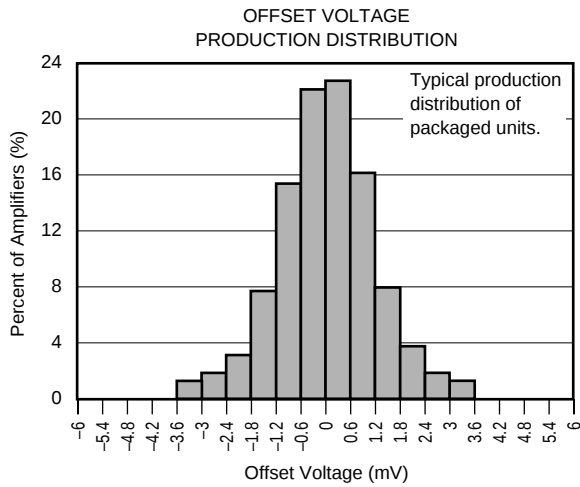
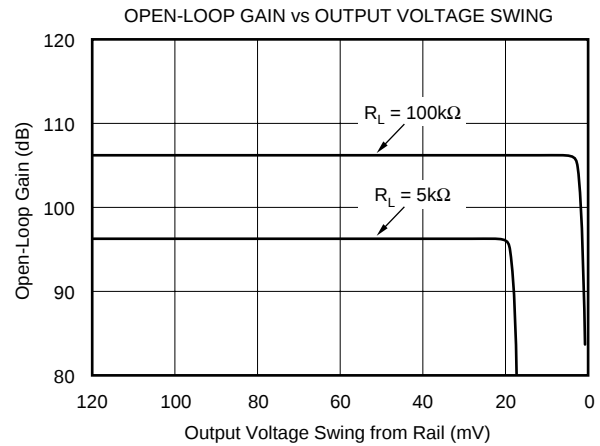
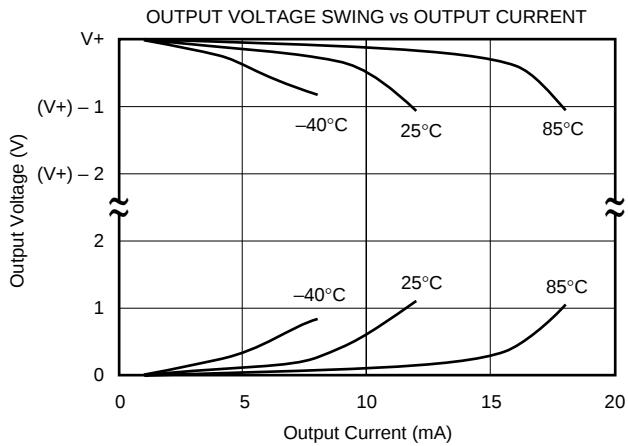
# TYPICAL PERFORMANCE CURVES (Cont.)

At  $T_A = +25^\circ\text{C}$ ,  $V_S = +5\text{V}$ , and  $R_L = 10\text{k}\Omega$  connected to  $V_S/2$ , unless otherwise noted.



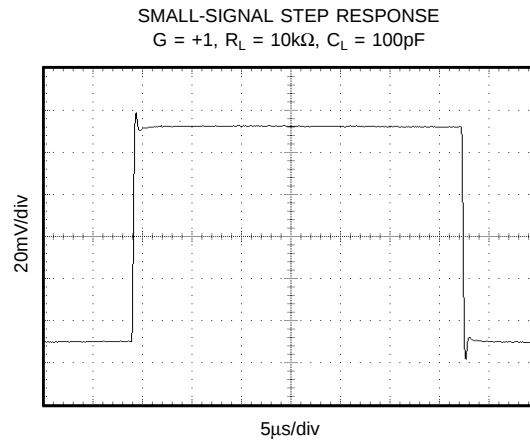
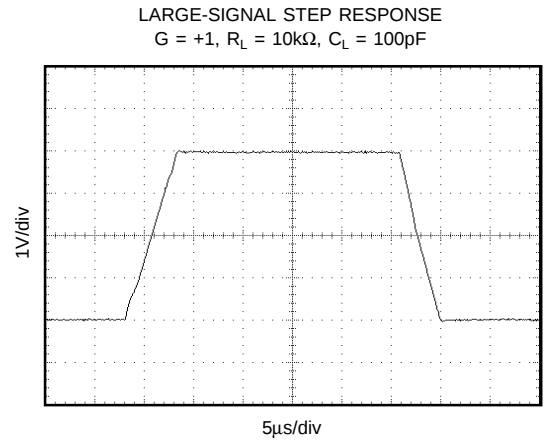
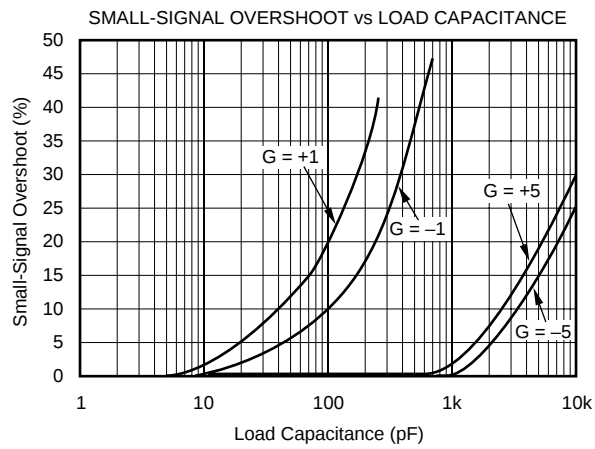
# TYPICAL PERFORMANCE CURVES (Cont.)

At  $T_A = +25^\circ\text{C}$ ,  $V_S = +5\text{V}$ , and  $R_L = 10\text{k}\Omega$  connected to  $V_S/2$ , unless otherwise noted.



# TYPICAL PERFORMANCE CURVES (Cont.)

At  $T_A = +25^\circ\text{C}$ ,  $V_S = +5\text{V}$ , and  $R_L = 10\text{k}\Omega$  connected to  $V_S/2$ , unless otherwise noted.



## APPLICATIONS INFORMATION

OPA342 series op amps are unity gain stable and can operate on a single supply, making them highly versatile and easy to use.

Rail-to-rail input and output swing significantly increases dynamic range, especially in low supply applications. Figure 1 shows the input and output waveforms for the OPA342 in unity-gain configuration. Operation is from  $V_S = +5V$  with a  $10k\Omega$  load connected to  $V_S/2$ . The input is a  $5V_{p-p}$  sinusoid. Output voltage is approximately  $4.997V_{p-p}$ .

Power supply pins should be bypassed with  $0.01\mu F$  ceramic capacitors.

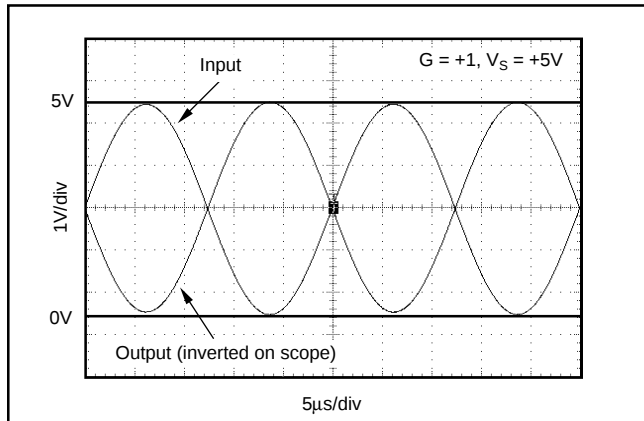


FIGURE 1. Rail-to-Rail Input and Output.

## OPERATING VOLTAGE

OPA342 series op amps are fully specified and guaranteed from  $+2.7V$  to  $+5.5V$ . In addition, many specifications apply from  $-40^{\circ}C$  to  $+85^{\circ}C$ . Parameters that vary significantly with operating voltages or temperature are shown in the Typical Performance Curves.

## RAIL-TO-RAIL INPUT

The input common-mode voltage range of the OPA342 series extends  $300mV$  beyond the supply rails. This is achieved with a complementary input stage—an N-channel input differential pair in parallel with a P-channel differential pair (see Figure 2). The N-channel pair is active for input voltages close to the positive rail, typically  $(V+) - 1.3V$  to  $300mV$  above the positive supply, while the P-channel pair is on for inputs from  $300mV$  below the negative supply to approximately  $(V+) - 1.3V$ . There is a small transition region, typically  $(V+) - 1.5V$  to  $(V+) - 1.1V$ , in which both pairs are on. This  $400mV$  transition region can vary  $300mV$  with process variation. Thus, the transition region (both stages on) can range from  $(V+) - 1.8V$  to  $(V+) - 1.4V$  on the low end, up to  $(V+) - 1.2V$  to  $(V+) - 0.8V$  on the high end. Within the  $400mV$  transition region PSRR, CMRR, offset voltage, offset drift, and THD may be degraded compared to operation outside this region. For more information on designing with rail-to-rail input op amps, see Figure 3 “Design Optimization with Rail-to-Rail Input Op Amps.”

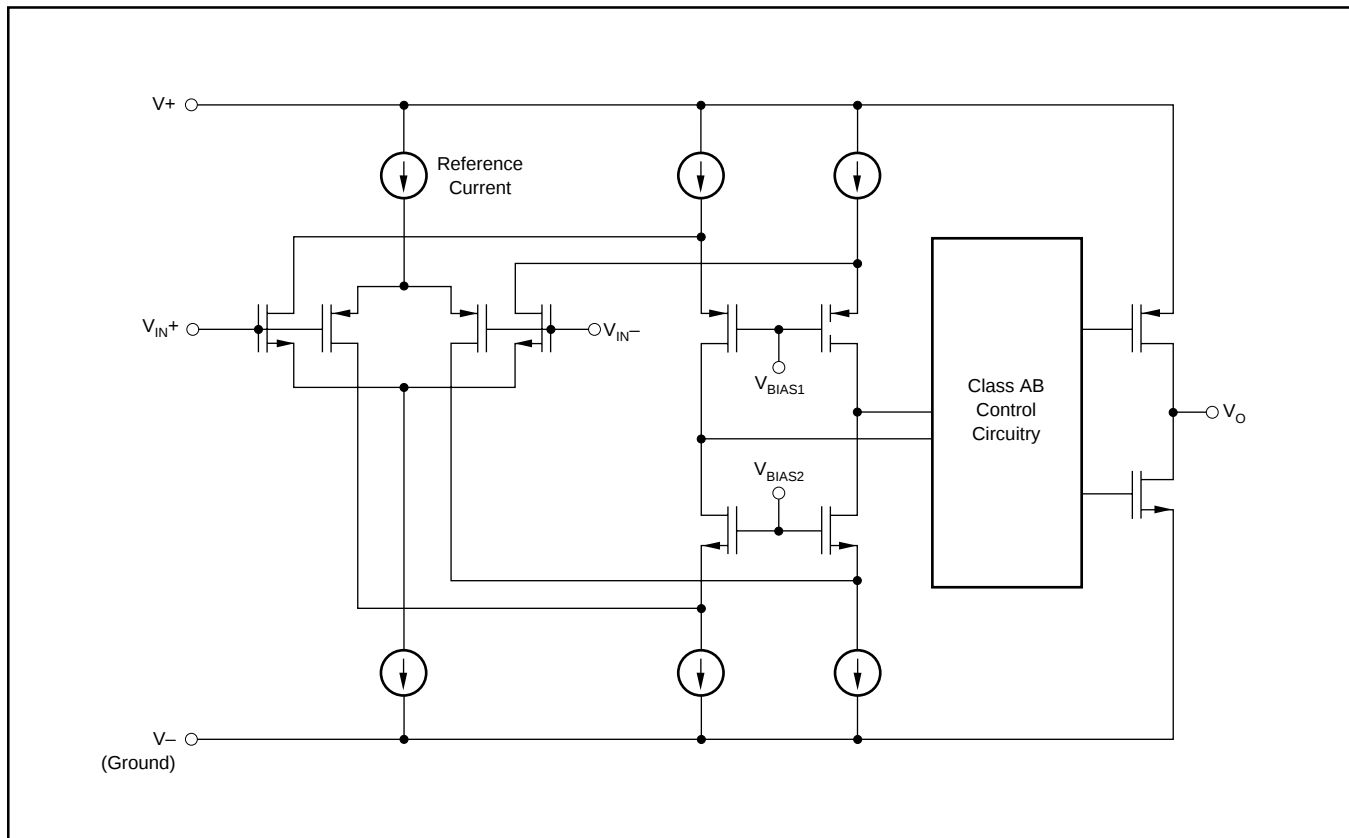


FIGURE 2. Simplified Schematic.

## DESIGN OPTIMIZATION WITH RAIL-TO-RAIL INPUT OP AMPS

Rail-to-rail op amps can be used in virtually any op amp configuration. To achieve optimum performance, however, applications using these special double-input-stage op amps may benefit from consideration of their special behavior.

In many applications, operation remains within the common-mode range of only one differential input pair. However some applications exercise the amplifier through the transition region of both differential input stages. Although the two input stages are laser trimmed for excellent matching, a small discontinuity may occur in this transition. Careful selection of the circuit configuration, signal levels and biasing can often avoid this transition region.

With a unity-gain buffer, for example, signals will traverse this transition at approximately 1.3V below  $V_+$  supply and may exhibit a small discontinuity at this point.

The common-mode voltage of the non-inverting amplifier is equal to the input voltage. If the input signal always remains less than the transition voltage, no discontinuity will be created. The closed-loop gain of this configuration can still produce a rail-to-rail output.

Inverting amplifiers have a constant common-mode voltage equal to  $V_B$ . If this bias voltage is constant, no discontinuity will be created. The bias voltage can generally be chosen to avoid the transition region.

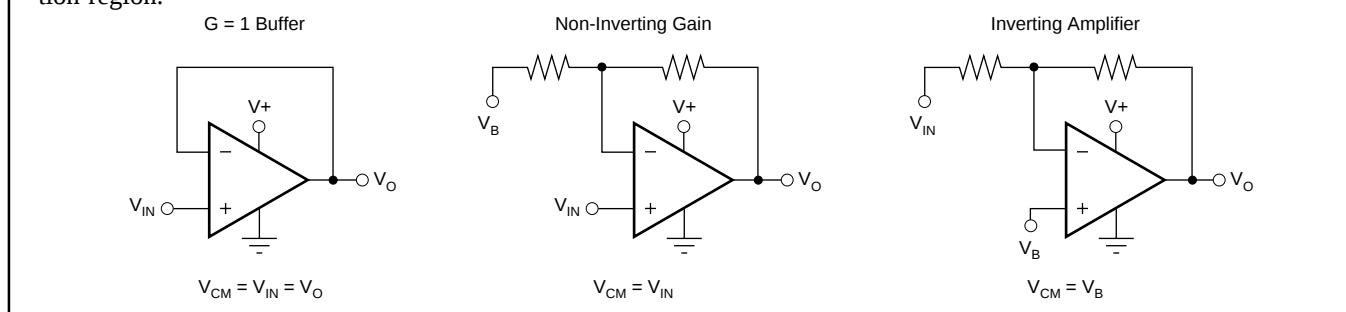


FIGURE 3. Design Optimization with Rail-to-Rail Input Op Amps.

### COMMON-MODE REJECTION

The CMRR for the OPA342 is specified in several ways so the best match for a given application may be used. First, the CMRR of the device in the common-mode range below the transition region ( $V_{CM} < (V_+) - 1.8V$ ) is given. This specification is the best indicator of the capability of the device when the application requires use of one of the differential input pairs. Second, the CMRR at  $V_S = 5.5V$  over the entire common-mode range is specified. Third, the CMRR at  $V_S = 2.7V$  over the entire common-mode range is provided. These last two values include the variations seen through the transition region.

### INPUT VOLTAGE BEYOND THE RAILS

If the input voltage can go more than 0.3V below the negative power supply rail (single-supply ground), special precautions are required. If the input voltage goes sufficiently negative, the op amp output may lock up in an inoperative state. A Schottky diode clamp circuit will prevent this—see Figure 4. The series resistor prevents excessive current (greater than 10mA) in the Schottky diode and in the internal ESD protection diode, if the input voltage can exceed the positive supply voltage. If the signal source is limited to less than 10mA, the input resistor is not required.

### RAIL-TO-RAIL OUTPUT

A class AB output stage with common-source transistors is used to achieve rail-to-rail output. This output stage is capable of driving 600Ω loads connected to any potential

between  $V_+$  and ground. For light resistive loads ( $> 50k\Omega$ ), the output voltage can typically swing to within 1mV from supply rail. With moderate resistive loads ( $2k\Omega$  to  $50k\Omega$ ), the output can swing to within a few tens of milli-volts from the supply rails while maintaining high open-loop gain. See the typical performance curve “Output Voltage Swing vs Output Current.”

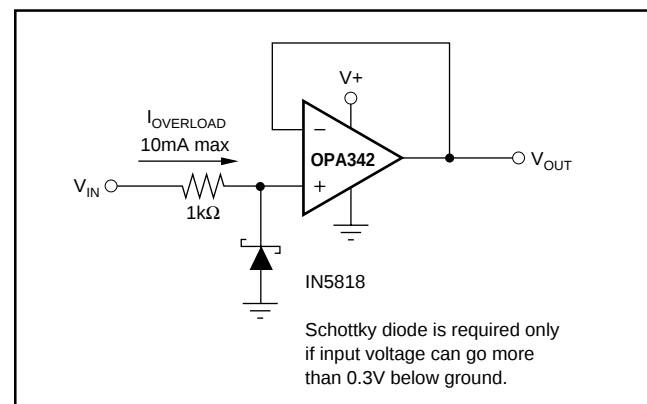


FIGURE 4. Input Current Protection for Voltages Exceeding the Supply Voltage.

### CAPACITIVE LOAD AND STABILITY

The OPA342 in a unity-gain configuration can directly drive up to 250pF pure capacitive load. Increasing the gain enhances the amplifier's ability to drive greater capacitive loads. See the typical performance curve “Small-Signal

Overshoot vs Capacitive Load.” In unity-gain configurations, capacitive load drive can be improved by inserting a small ( $10\Omega$  to  $20\Omega$ ) resistor,  $R_S$ , in series with the output, as shown in Figure 5. This significantly reduces ringing while maintaining dc performance for purely capacitive loads. However, if there is a resistive load in parallel with the capacitive load, a voltage divider is created, introducing a dc error at the output and slightly reducing the output swing. The error introduced is proportional to the ratio  $R_S/R_L$ , and is generally negligible.

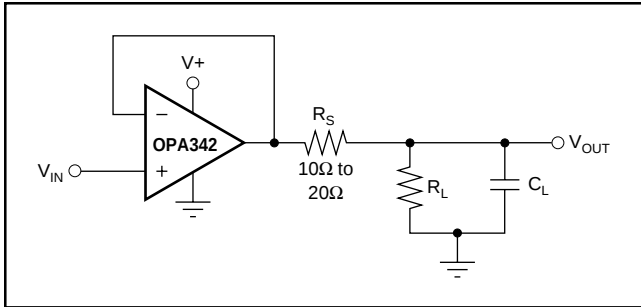


FIGURE 5. Series Resistor in Unity-Gain Configuration Improves Capacitive Load Drive.

## DRIVING A/D CONVERTERS

The OPA342 series op amps are optimized for driving medium-speed sampling ADCs. The OPA342 op amps buffer the ADC's input capacitance and resulting charge injection while providing signal gain.

Figure 6 shows the OPA342 in a basic noninverting configuration driving the ADS7822. The ADS7822 is a 12-bit, micro-power sampling converter in the MSOP-8 package. When used with the low-power, miniature packages of the OPA342, the combination is ideal for space-limited, low-power applications. In this configuration, an RC network at the ADC's input can be used to filter charge injection.

Figure 7 shows the OPA2342 driving an ADS7822 in a speech bandpass filtered data acquisition system. This small, low-cost solution provides the necessary amplification and signal conditioning to interface directly with an electret microphone. This circuit will operate with  $V_S = +2.7V$  to  $+5V$  with less than  $500\mu A$  quiescent current.

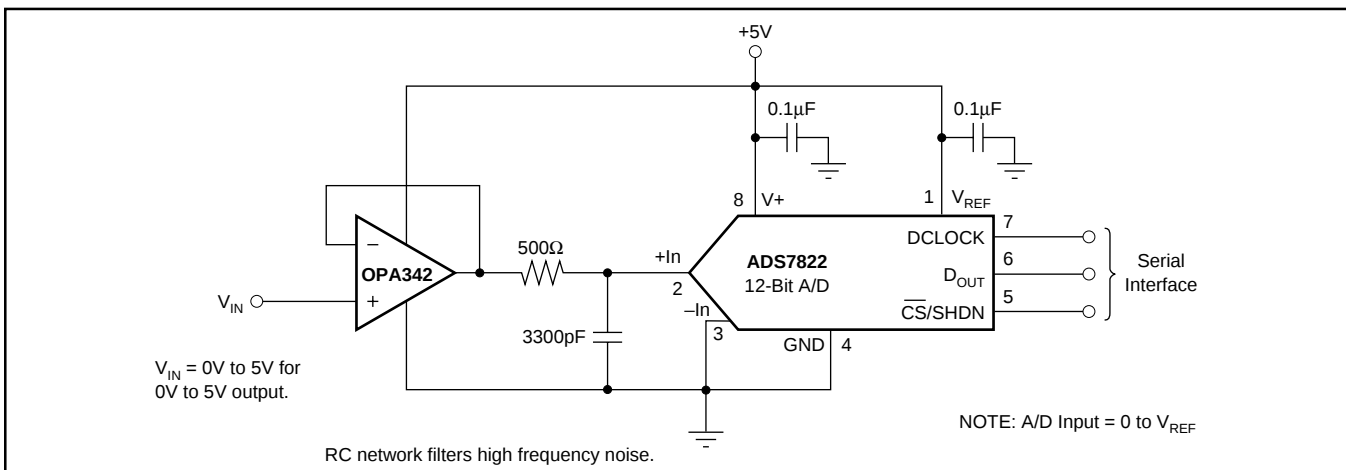


FIGURE 6. OPA342 in Noninverting Configuration Driving ADS7822.

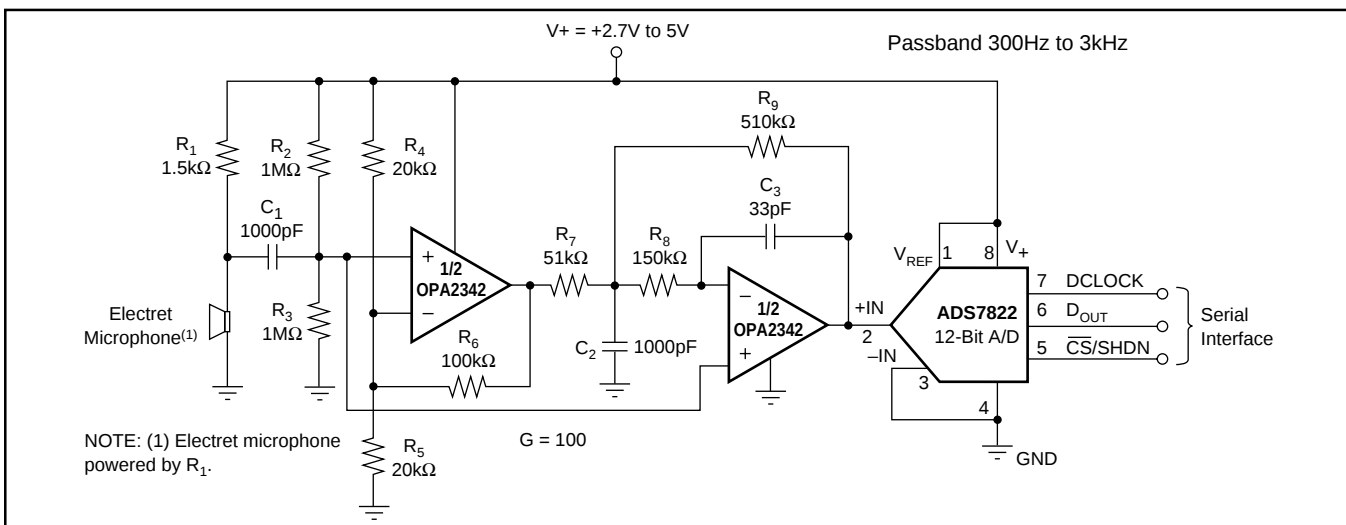


FIGURE 7. Speech Bandpass Filtered Data Acquisition System.

**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| OPA2342EA/250    | ACTIVE        | VSSOP        | DGK                | 8    | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAUAG             | Level-2-260C-1 YEAR  | -40 to 85    | C42                     | <a href="#">Samples</a> |
| OPA2342EA/250G4  | ACTIVE        | VSSOP        | DGK                | 8    | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAUAG             | Level-2-260C-1 YEAR  | -40 to 85    | C42                     | <a href="#">Samples</a> |
| OPA2342EA/2K5    | ACTIVE        | VSSOP        | DGK                | 8    | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAUAG             | Level-2-260C-1 YEAR  | -40 to 85    | C42                     | <a href="#">Samples</a> |
| OPA2342UA        | ACTIVE        | SOIC         | D                  | 8    | 75             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-2-260C-1 YEAR  | -40 to 85    | OPA<br>2342UA           | <a href="#">Samples</a> |
| OPA2342UA/2K5    | ACTIVE        | SOIC         | D                  | 8    | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-2-260C-1 YEAR  | -40 to 85    | OPA<br>2342UA           | <a href="#">Samples</a> |
| OPA2342UA/2K5G4  | ACTIVE        | SOIC         | D                  | 8    | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-2-260C-1 YEAR  | -40 to 85    | OPA<br>2342UA           | <a href="#">Samples</a> |
| OPA2342UAG4      | ACTIVE        | SOIC         | D                  | 8    | 75             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-2-260C-1 YEAR  | -40 to 85    | OPA<br>2342UA           | <a href="#">Samples</a> |
| OPA342NA/250     | ACTIVE        | SOT-23       | DBV                | 5    | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-2-260C-1 YEAR  | -40 to 85    | B42                     | <a href="#">Samples</a> |
| OPA342NA/250G4   | ACTIVE        | SOT-23       | DBV                | 5    | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-2-260C-1 YEAR  | -40 to 85    | B42                     | <a href="#">Samples</a> |
| OPA342NA/3K      | ACTIVE        | SOT-23       | DBV                | 5    | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-2-260C-1 YEAR  | -40 to 85    | B42                     | <a href="#">Samples</a> |
| OPA342NA/3KG4    | ACTIVE        | SOT-23       | DBV                | 5    | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-2-260C-1 YEAR  | -40 to 85    | B42                     | <a href="#">Samples</a> |
| OPA342UA         | ACTIVE        | SOIC         | D                  | 8    | 75             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-2-260C-1 YEAR  | -40 to 85    | OPA<br>342UA            | <a href="#">Samples</a> |
| OPA342UAG4       | ACTIVE        | SOIC         | D                  | 8    | 75             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-2-260C-1 YEAR  | -40 to 85    | OPA<br>342UA            | <a href="#">Samples</a> |
| OPA4342EA/250    | ACTIVE        | TSSOP        | PW                 | 14   | 250            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-2-260C-1 YEAR  | -40 to 85    | OPA<br>4342EA           | <a href="#">Samples</a> |
| OPA4342PA        | LIFEBUY       | PDIP         | N                  | 14   | 25             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | N / A for Pkg Type   |              | OPA4342PA               |                         |
| OPA4342UA        | ACTIVE        | SOIC         | D                  | 14   | 50             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-2-260C-1 YEAR  | -40 to 85    | OPA4342UA               | <a href="#">Samples</a> |
| OPA4342UAG4      | ACTIVE        | SOIC         | D                  | 14   | 50             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-2-260C-1 YEAR  | -40 to 85    | OPA4342UA               | <a href="#">Samples</a> |

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

<sup>(3)</sup> MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

<sup>(4)</sup> There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

<sup>(5)</sup> Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

<sup>(6)</sup> Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

**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 |
|---------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| OPA2342EA/250 | VSSOP        | DGK             | 8    | 250  | 180.0              | 12.4               | 5.3     | 3.4     | 1.4     | 8.0     | 12.0   | Q1            |
| OPA2342EA/2K5 | VSSOP        | DGK             | 8    | 2500 | 330.0              | 12.4               | 5.3     | 3.4     | 1.4     | 8.0     | 12.0   | Q1            |
| OPA2342UA/2K5 | SOIC         | D               | 8    | 2500 | 330.0              | 12.4               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |
| OPA4342EA/250 | TSSOP        | PW              | 14   | 250  | 180.0              | 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) |
|---------------|--------------|-----------------|------|------|-------------|------------|-------------|
| OPA2342EA/250 | VSSOP        | DGK             | 8    | 250  | 210.0       | 185.0      | 35.0        |
| OPA2342EA/2K5 | VSSOP        | DGK             | 8    | 2500 | 367.0       | 367.0      | 35.0        |
| OPA2342UA/2K5 | SOIC         | D               | 8    | 2500 | 367.0       | 367.0      | 35.0        |
| OPA4342EA/250 | TSSOP        | PW              | 14   | 250  | 210.0       | 185.0      | 35.0        |

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

### Products

|                              |                                                                                      |
|------------------------------|--------------------------------------------------------------------------------------|
| Audio                        | <a href="http://www.ti.com/audio">www.ti.com/audio</a>                               |
| Amplifiers                   | <a href="http://amplifier.ti.com">amplifier.ti.com</a>                               |
| Data Converters              | <a href="http://dataconverter.ti.com">dataconverter.ti.com</a>                       |
| DLP® Products                | <a href="http://www.dlp.com">www.dlp.com</a>                                         |
| DSP                          | <a href="http://dsp.ti.com">dsp.ti.com</a>                                           |
| Clocks and Timers            | <a href="http://www.ti.com/clocks">www.ti.com/clocks</a>                             |
| Interface                    | <a href="http://interface.ti.com">interface.ti.com</a>                               |
| Logic                        | <a href="http://logic.ti.com">logic.ti.com</a>                                       |
| Power Mgmt                   | <a href="http://power.ti.com">power.ti.com</a>                                       |
| Microcontrollers             | <a href="http://microcontroller.ti.com">microcontroller.ti.com</a>                   |
| RFID                         | <a href="http://www.ti-rfid.com">www.ti-rfid.com</a>                                 |
| OMAP Applications Processors | <a href="http://www.ti.com/omap">www.ti.com/omap</a>                                 |
| Wireless Connectivity        | <a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a> |

### Applications

|                               |                                                                                          |
|-------------------------------|------------------------------------------------------------------------------------------|
| Automotive and Transportation | <a href="http://www.ti.com/automotive">www.ti.com/automotive</a>                         |
| Communications and Telecom    | <a href="http://www.ti.com/communications">www.ti.com/communications</a>                 |
| Computers and Peripherals     | <a href="http://www.ti.com/computers">www.ti.com/computers</a>                           |
| Consumer Electronics          | <a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>                   |
| Energy and Lighting           | <a href="http://www.ti.com/energy">www.ti.com/energy</a>                                 |
| Industrial                    | <a href="http://www.ti.com/industrial">www.ti.com/industrial</a>                         |
| Medical                       | <a href="http://www.ti.com/medical">www.ti.com/medical</a>                               |
| Security                      | <a href="http://www.ti.com/security">www.ti.com/security</a>                             |
| Space, Avionics and Defense   | <a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a> |
| Video and Imaging             | <a href="http://www.ti.com/video">www.ti.com/video</a>                                   |

### TI E2E Community

[e2e.ti.com](http://e2e.ti.com)