

**OPA137**  
**OPA2137**  
**OPA4137**

## LOW COST FET-INPUT OPERATIONAL AMPLIFIERS

### *MicroAmplifier™ Series*

#### FEATURES

- FET INPUT:  $I_B = 5\text{pA}$
- LOW OFFSET VOLTAGE:  $1.5\text{mV}$
- WIDE SUPPLY RANGE:  $\pm 2.25\text{V}$  to  $\pm 18\text{V}$
- LOW QUIESCENT CURRENT:  $220\mu\text{A}/\text{channel}$
- EXCELLENT SPEED/POWER:  $1\text{MHz}$
- INPUT TO POSITIVE SUPPLY
- *MicroSIZE* PACKAGES: SOT-23-5, MSOP-8
- SINGLE, DUAL, AND QUAD

#### APPLICATIONS

- STRAIN GAGE AMPLIFIER
- PHOTODETECTOR AMPLIFIER
- PRECISION INTEGRATOR
- BATTERY-POWERED INSTRUMENTS
- TEST EQUIPMENT
- ACTIVE FILTERS

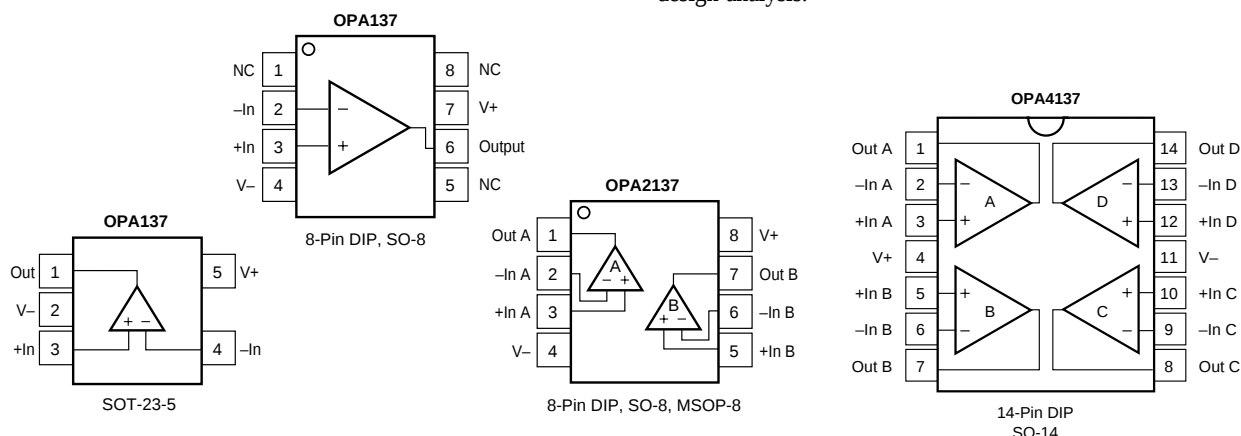
#### DESCRIPTION

OPA137 series FET-input operational amplifiers are designed for low cost and miniature applications. In addition to small size (SOT-23-5 and MSOP-8 packages), they provide low input bias current (5pA), low quiescent current (220μA/channel), and high open-loop gain (94dB).

Either single (+4.5V to +36V) or dual ( $\pm 2.25$  to  $\pm 18\text{V}$ ) supplies can be used. The input common-mode voltage range includes the positive supply—suitable for many single-supply applications. Single, dual, and quad versions have identical specifications for maximum design flexibility.

OPA137 op amps are easy to use and free from phase inversion and overload problems found in some FET-input amplifiers. High performance, including linearity, is maintained as the amplifiers swing to their specified limits. In addition, the combination of high slew rate ( $3.5\text{V}/\mu\text{s}$ ) and wide bandwidth (1MHz) provide fast settling time assuring good dynamic response. Dual and quad designs feature completely independent circuitry for lowest crosstalk and freedom from interaction.

The single (OPA137) packages are the tiny 5-lead SOT-23-5 surface mount, SO-8 surface mount, and 8-pin DIP. The dual (OPA2137) comes in the miniature MSOP-8 surface mount, SO-8 surface mount, and 8-pin DIP packages. The quad (OPA4137) packages are the SO-14 surface mount and the 14-pin DIP. All are specified from  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$  and operate from  $-55^\circ\text{C}$  to  $+125^\circ\text{C}$ . A SPICE macromodel is available for design analysis.



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

# SPECIFICATIONS: $V_S = \pm 15V$

At  $T_A = +25^\circ\text{C}$ ,  $R_L = 10k\Omega$  connected to ground, unless otherwise noted.

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

| PARAMETER                                                                                                                                                                                                                                                   | CONDITION                                                                                                                                                                   | OPA137N, U, P<br>OPA2137E, U, P<br>OPA4137U, P           |                                                       |                                                                | OPA137NA, UA, PA<br>OPA2137EA, UA, PA<br>OPA4137UA, PA |                                        |                                                       | UNITS                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------|----------------------------------------|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                             |                                                                                                                                                                             | MIN                                                      | TYP                                                   | MAX                                                            | MIN                                                    | TYP                                    | MAX                                                   |                                                                                                                                                                                              |
| <b>OFFSET VOLTAGE</b><br>Input Offset Voltage $V_{OS}$<br>$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$<br>vs Temperature $dV_{OS}/dT$<br>vs Power Supply PSRR<br>$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$<br>Channel Separation (dual, quad) dc | $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$<br>$V_S = \pm 3V$ to $\pm 18V$                                                                                             |                                                          | $\pm 1.5$<br>$\pm 2.5$<br>$\pm 15$<br>$\pm 90$<br>0.6 | $\pm 3$<br>$\pm 7$<br>$\pm 250$<br><b><math>\pm 250</math></b> |                                                        | $\pm 2.5$<br>$\pm 3.5$<br>*<br>*<br>*  | $\pm 10$<br><b><math>\pm 15</math></b><br>*<br>*<br>* | mV<br>mV<br>$\mu\text{V}/^\circ\text{C}$<br>$\mu\text{V}/V$<br>$\mu\text{V}/V$                                                                                                               |
| <b>INPUT BIAS CURRENT</b><br>Input Bias Current $I_B$<br>vs Temperature<br>Input Offset Current $I_{OS}$                                                                                                                                                    | $V_{CM} = 0V$                                                                                                                                                               |                                                          | $\pm 5$<br>See Typical Curve<br>$\pm 2$               | $\pm 100$<br>$\pm 50$                                          |                                                        | *<br>*<br>*                            | *<br>*<br>*                                           | pA<br>pA                                                                                                                                                                                     |
| <b>NOISE</b><br>Input Voltage Noise, $f = 0.1$ to $10\text{Hz}$<br>Input Voltage Noise Density, $f = 1\text{kHz}$ $e_n$<br>Current Noise Density, $f = 1\text{kHz}$ $i_n$                                                                                   |                                                                                                                                                                             |                                                          | 2<br>45<br>1.2                                        |                                                                |                                                        | *<br>*<br>*                            |                                                       | $\mu\text{Vp-p}$<br>$\text{nV}/\sqrt{\text{Hz}}$<br>$\text{fA}/\sqrt{\text{Hz}}$                                                                                                             |
| <b>INPUT VOLTAGE RANGE</b><br>Common-Mode Voltage Range $V_{CM}$<br>Common-Mode Rejection Ratio CMRR<br>OPA137, OPA2137<br>OPA4137<br>$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$<br>OPA137, OPA2137<br>OPA4137                                        | $V_{CM} = -12V$ to $15V$<br><br>$V_{CM} = -12V$ to $15V$                                                                                                                    | $(V-) + 3$<br><br>76<br>74<br><br><b>72</b><br><b>70</b> | <br><br>84<br>84                                      | $(V+)$<br><br><br><br>                                         | *<br><br>70<br>70<br><br><b>70</b><br><b>70</b>        | *<br><br>*<br>*                        | *<br><br><br><br>                                     | V<br><br>dB<br>dB<br><br>dB<br>dB                                                                                                                                                            |
| <b>INPUT IMPEDANCE</b><br>Differential<br>Common-Mode                                                                                                                                                                                                       |                                                                                                                                                                             |                                                          | $10^{10} \parallel 1$<br>$10^{12} \parallel 2$        |                                                                |                                                        | *<br>*                                 |                                                       | $\Omega \parallel \text{pF}$<br>$\Omega \parallel \text{pF}$                                                                                                                                 |
| <b>OPEN-LOOP GAIN</b><br>Open-Loop Voltage Gain $A_{OL}$<br>$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$                                                                                                                                                | $V_O = -13.8V$ to $13.9V$<br>$V_O = -13.8V$ to $13.9V$                                                                                                                      | 86<br><b>86</b>                                          | 94                                                    |                                                                | *<br>*                                                 | *<br>*                                 |                                                       | dB<br>dB                                                                                                                                                                                     |
| <b>FREQUENCY RESPONSE</b><br>Gain-Bandwidth Product GBW<br>Slew Rate SR<br>Settling Time, 0.1%<br>0.01%<br>Overload Recovery Time<br>Total Harmonic Distortion + Noise THD+N                                                                                | $G = 1$<br>$G = 1$ , $10V$ Step, $C_L = 100\text{pF}$<br>$G = 1$ , $10V$ Step, $C_L = 100\text{pF}$<br>$V_{IN} \cdot G = V_S$<br>$G = 1$ , $f = 1\text{kHz}$ , $3.5V_{rms}$ |                                                          | 1<br>3.5<br>8<br>10<br>1<br>0.05                      |                                                                |                                                        | *<br>*<br>*<br>*<br>*<br>*             |                                                       | MHz<br>V/ $\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$<br>$\mu\text{s}$<br>%                                                                                                              |
| <b>OUTPUT</b><br>Voltage Output $V_{OUT}$<br>$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$<br>Short-Circuit Current $I_{SC}$<br>Capacitive Load Drive $C_{LOAD}$                                                                                         |                                                                                                                                                                             | $(V-) + 1.2$<br>$(V-) + 1.2$                             | <br><br>$-25/+60$<br>1000                             | $(V+) - 1.1$<br>$(V+) - 1.1$                                   | *<br>*                                                 | <br>*<br>*                             | *<br>*                                                | V<br>V<br>mA<br>pF                                                                                                                                                                           |
| <b>POWER SUPPLY</b><br>Specified Operating Range $V_S$<br>Operating Voltage Range<br>Dual Supplies<br>Single Supply<br>Quiescent Current $I_Q$<br>$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$                                                          | $I_O = 0$<br>$I_O = 0$                                                                                                                                                      | $\pm 2.25^{(1)}$<br>+4.5                                 | $\pm 15$<br><br>$\pm 220$                             | $\pm 18$<br>+36<br>$\pm 270$<br><b><math>\pm 375</math></b>    | *<br>*                                                 | *<br>*                                 | *<br>*<br>*<br>*                                      | V<br>V<br>V<br>$\mu\text{A}$<br>$\mu\text{A}$                                                                                                                                                |
| <b>TEMPERATURE RANGE</b><br>Specified Range<br>Operating Range<br>Storage Range<br>Thermal Resistance $\theta_{JA}$<br>SOT-23-5 Surface Mount<br>MSOP-8 Surface Mount<br>SO-8 Surface Mount<br>8-Pin DIP<br>SO-14 Surface Mount<br>14-Pin DIP               |                                                                                                                                                                             | -40<br>-55<br>-55                                        | <br><br><br>200<br>150<br>150<br>100<br>100<br>80     | +85<br>+125<br>+125                                            | *<br>*<br>*                                            | <br><br><br>*<br>*<br>*<br>*<br>*<br>* | *<br>*<br>*                                           | $^\circ\text{C}$<br>$^\circ\text{C}$<br>$^\circ\text{C}$<br>$^\circ\text{C}/W$<br>$^\circ\text{C}/W$<br>$^\circ\text{C}/W$<br>$^\circ\text{C}/W$<br>$^\circ\text{C}/W$<br>$^\circ\text{C}/W$ |

\* Specifications the same as OPA137N, U, P.

NOTE: (1) At minimum power supply voltage inputs must be biased above ground in accordance with common-mode voltage range restrictions—see “Operating Voltage” discussion.

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

|                                           |                          |
|-------------------------------------------|--------------------------|
| Supply Voltage, V+ to V– .....            | 36V                      |
| Input Voltage .....                       | (V–) –0.7V to (V+) +0.7V |
| Input Current .....                       | 2mA                      |
| Output Short-Circuit <sup>(2)</sup> ..... | Continuous               |
| Operating Temperature .....               | –55°C to +125°C          |
| Storage Temperature .....                 | –55°C to +125°C          |
| Junction Temperature .....                | +150°C                   |
| Lead Temperature (soldering, 10s) .....   | 300°C                    |

NOTE: (1) Stresses above these ratings may cause permanent damage. Exposure to absolute maximum ratings for extended periods may affect device reliability. (2) 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

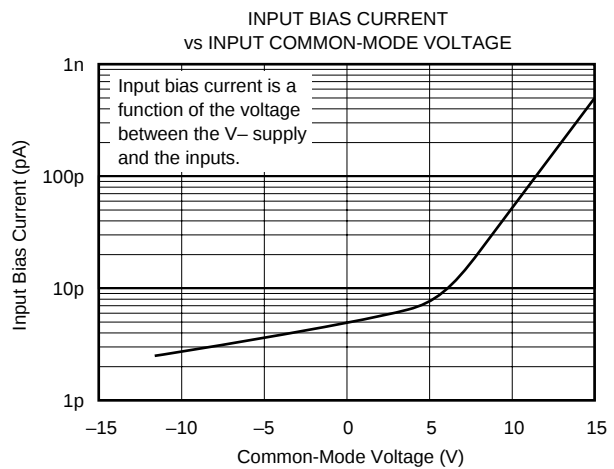
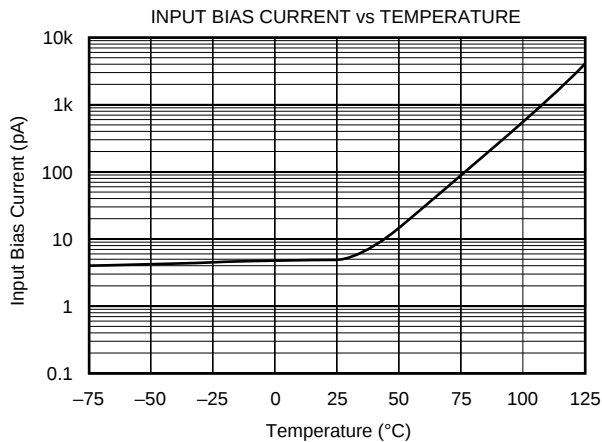
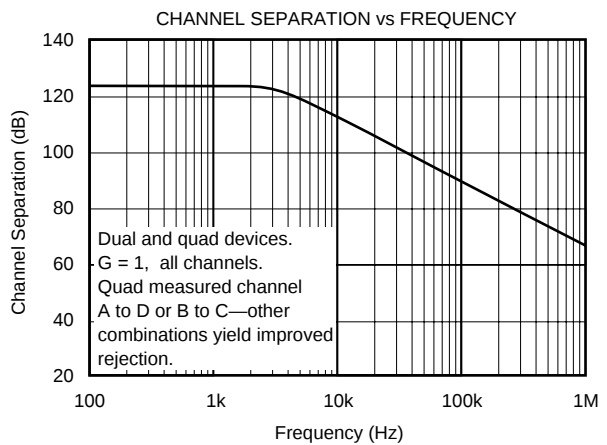
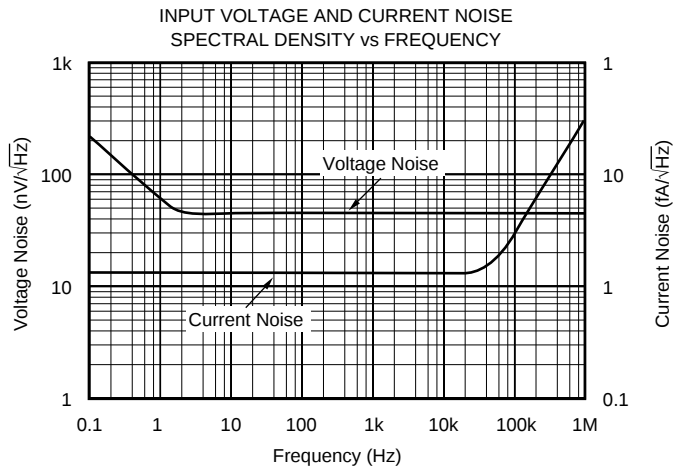
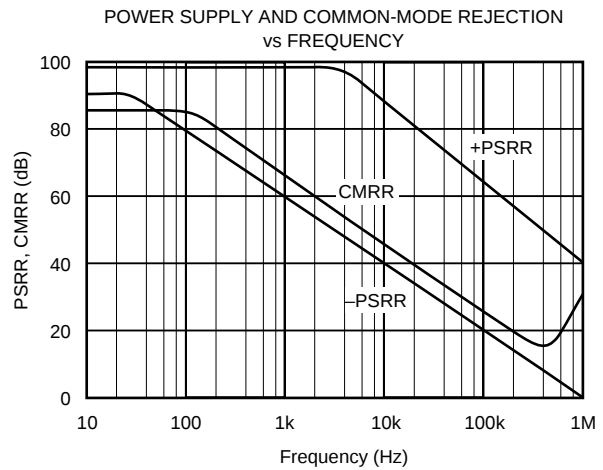
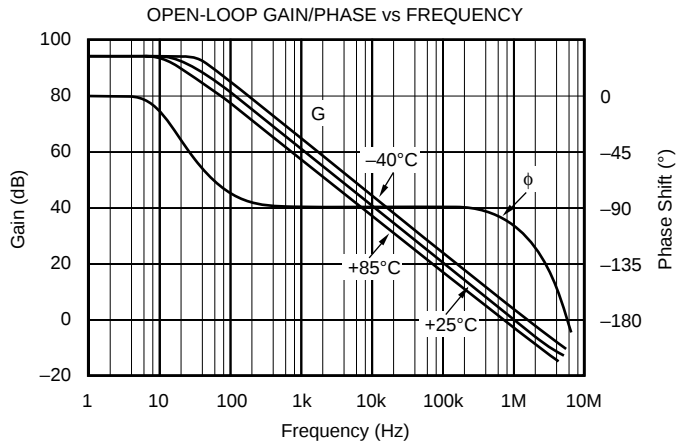
| PRODUCT       | PACKAGE                       | PACKAGE DRAWING NUMBER <sup>(1)</sup> | SPECIFIED TEMPERATURE RANGE | PACKAGE MARKING    | ORDERING NUMBER <sup>(2)</sup> | TRANSPORT MEDIA |
|---------------|-------------------------------|---------------------------------------|-----------------------------|--------------------|--------------------------------|-----------------|
| <b>Single</b> |                               |                                       |                             |                    |                                |                 |
| OPA137N       | 5-Lead SOT-23-5 Surface Mount | 331                                   | –40°C to +85°C              | E37 <sup>(3)</sup> | OPA137N/250                    | Tape and Reel   |
| "             | "                             | "                                     | "                           | "                  | OPA137N/3K                     | Tape and Reel   |
| OPA137NA      | 5-Lead SOT-23-5 Surface Mount | 331                                   | –40°C to +85°C              | E37 <sup>(3)</sup> | OPA137NA/250                   | Tape and Reel   |
| "             | "                             | "                                     | "                           | "                  | OPA137NA/3K                    | Tape and Reel   |
| OPA137U       | SO-8 Surface Mount            | 182                                   | –40°C to +85°C              | OPA137U            | OPA137U                        | Rails           |
| "             | "                             | "                                     | "                           | "                  | OPA137U/2K5                    | Tape and Reel   |
| OPA137UA      | SO-8 Surface Mount            | 182                                   | –40°C to +85°C              | OPA137UA           | OPA137UA                       | Rails           |
| "             | "                             | "                                     | "                           | "                  | OPA137UA/2K5                   | Tape and Reel   |
| OPA137P       | 8-Pin DIP                     | 006                                   | –40°C to +85°C              | OPA137P            | OPA137P                        | Rails           |
| OPA137PA      | 8-Pin DIP                     | 006                                   | –40°C to +85°C              | OPA137PA           | OPA137PA                       | Rails           |
| <b>Dual</b>   |                               |                                       |                             |                    |                                |                 |
| OPA2137E      | MSOP-8 Surface Mount          | 337                                   | –40°C to +85°C              | E37 <sup>(3)</sup> | OPA2137E/250                   | Tape and Reel   |
| "             | "                             | "                                     | "                           | "                  | OPA2137E/2K5                   | Tape and Reel   |
| OPA2137EA     | MSOP-8 Surface Mount          | 337                                   | –40°C to +85°C              | E37 <sup>(3)</sup> | OPA2137EA/250                  | Tape and Reel   |
| "             | "                             | "                                     | "                           | "                  | OPA2137EA/2K5                  | Tape and Reel   |
| OPA2137U      | SO-8 Surface Mount            | 182                                   | –40°C to +85°C              | OPA2137U           | OPA2137U                       | Rails           |
| "             | "                             | "                                     | "                           | "                  | OPA2137U/2K5                   | Tape and Reel   |
| OPA2137UA     | SO-8 Surface Mount            | 182                                   | –40°C to +85°C              | OPA2137UA          | OPA2137UA                      | Rails           |
| "             | "                             | "                                     | "                           | "                  | OPA2137UA/2K5                  | Tape and Reel   |
| OPA2137P      | 8-Pin DIP                     | 006                                   | –40°C to +85°C              | OPA2137P           | OPA2137P                       | Rails           |
| OPA2137PA     | 8-Pin DIP                     | 006                                   | –40°C to +85°C              | OPA2137PA          | OPA2137PA                      | Rails           |
| <b>Quad</b>   |                               |                                       |                             |                    |                                |                 |
| OPA4137U      | SO-14 Surface Mount           | 235                                   | –40°C to +85°C              | OPA4137U           | OPA4137U                       | Rails           |
| "             | "                             | "                                     | "                           | "                  | OPA4137U/2K5                   | Tape and Reel   |
| OPA4137UA     | SO-14 Surface Mount           | 235                                   | –40°C to +85°C              | OPA4137UA          | OPA4137UA                      | Rails           |
| "             | "                             | "                                     | "                           | "                  | OPA4137UA/2K5                  | Tape and Reel   |
| OPA4137P      | 14-Pin DIP                    | 010                                   | –40°C to +85°C              | OPA4137P           | OPA4137P                       | Rails           |
| OPA4137PA     | 14-Pin DIP                    | 010                                   | –40°C to +85°C              | OPA4137PA          | OPA4137PA                      | Rails           |

NOTES: (1) For detailed drawing and dimension table, please see end of data sheet, or Appendix C of Burr-Brown IC Data Book. (2) Models with a slash (/) are available only in Tape and Reel in the quantities indicated (e.g., /2K5 indicates 2500 devices per reel). Ordering 3000 pieces of "OPA137NA/3K" will get a single 3000-piece Tape and Reel. For detailed Tape and Reel mechanical information, refer to Appendix B of Burr-Brown IC Data Book. (3) Grade information is marked on the reel.

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

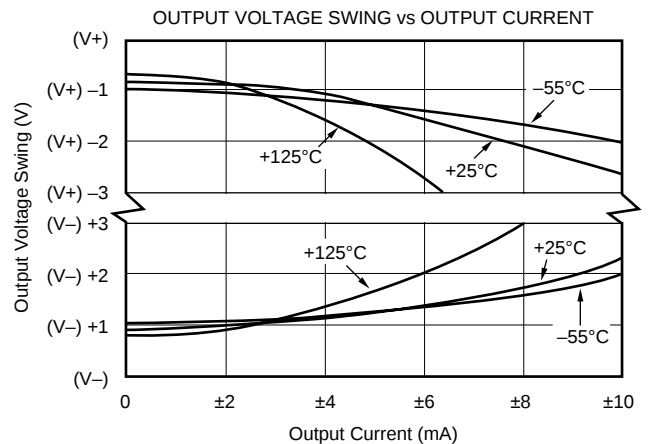
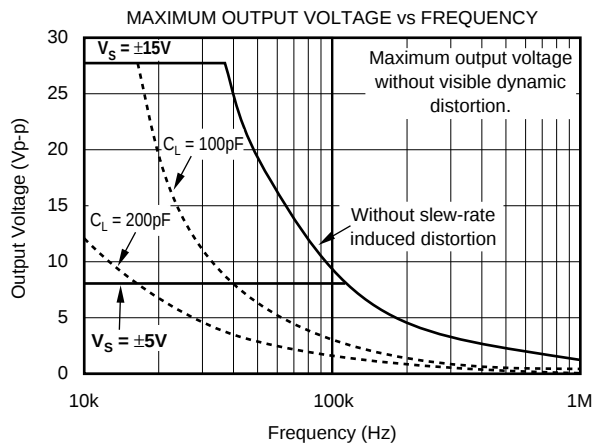
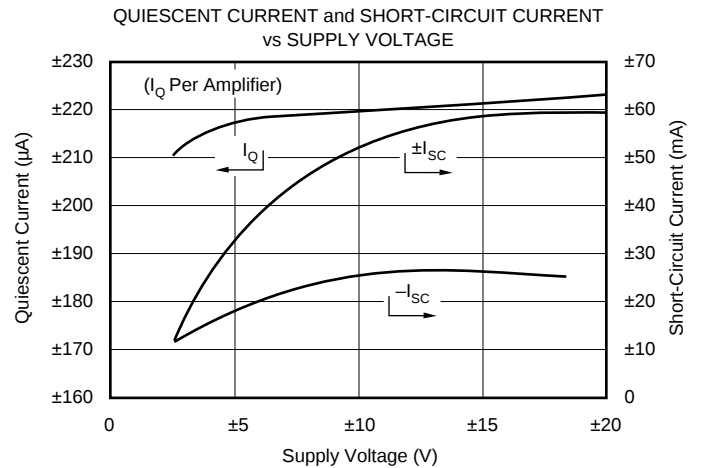
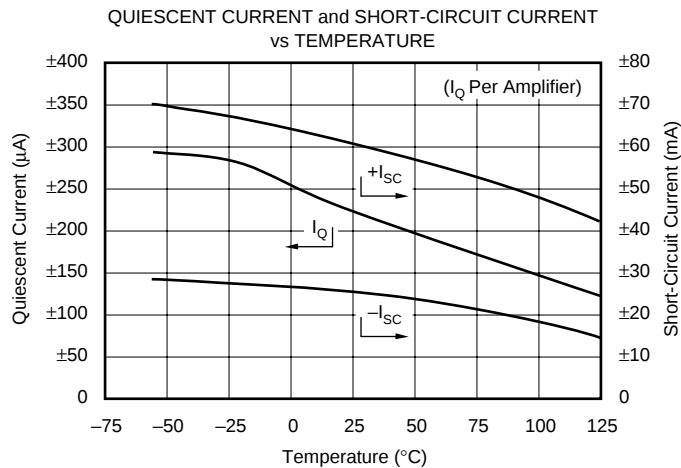
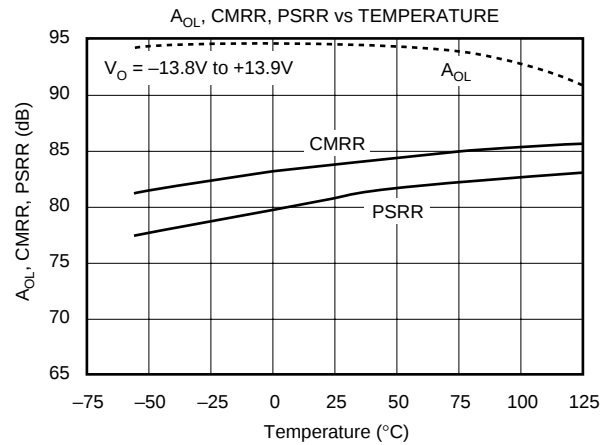
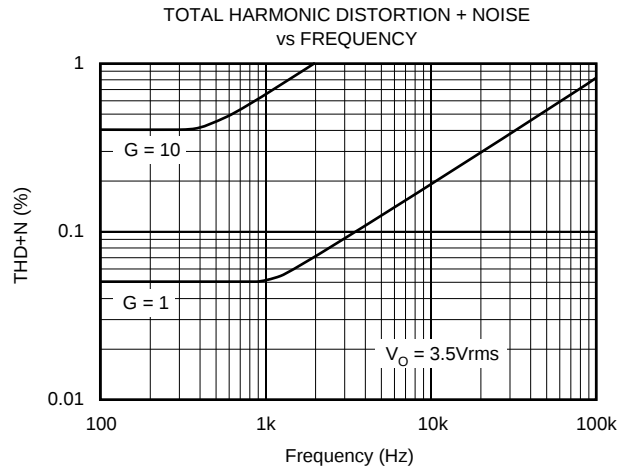
# TYPICAL PERFORMANCE CURVES

At  $T_A = +25^\circ\text{C}$ ,  $V_S = \pm 15\text{V}$ ,  $R_L = 10\text{k}\Omega$ , connected to ground, unless otherwise noted.



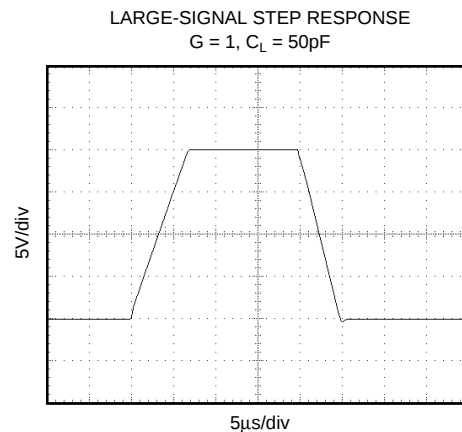
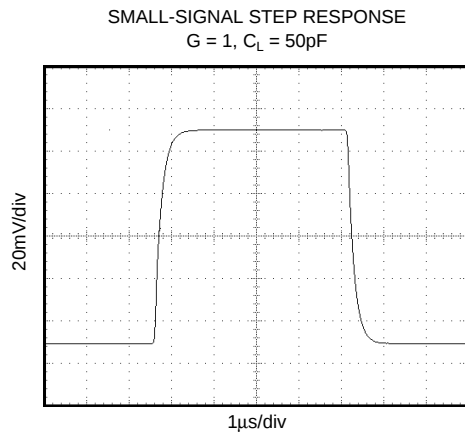
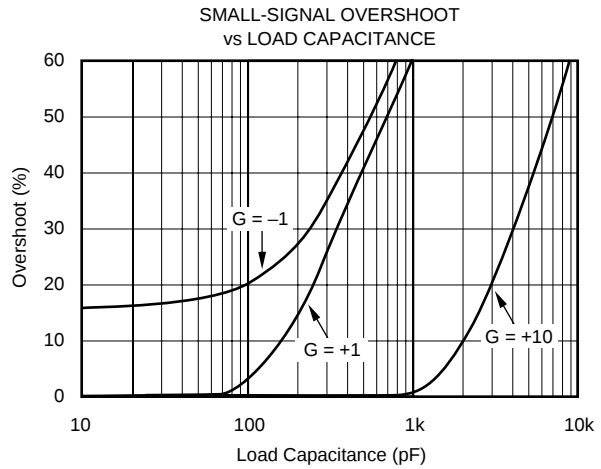
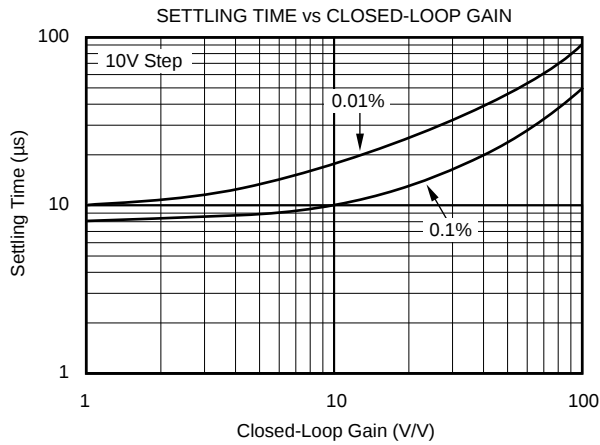
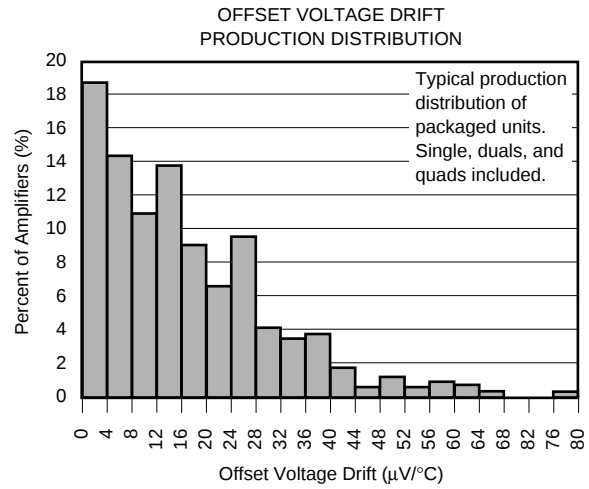
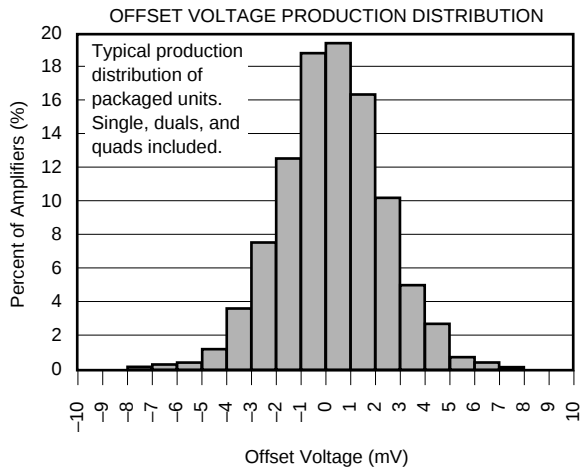
# TYPICAL PERFORMANCE CURVES (CONT)

At  $T_A = +25^\circ\text{C}$ ,  $V_S = \pm 15\text{V}$ ,  $R_L = 10\text{k}\Omega$ , connected to ground, unless otherwise noted.



# TYPICAL PERFORMANCE CURVES (CONT)

At  $T_A = +25^\circ\text{C}$ ,  $V_S = \pm 15\text{V}$ ,  $R_L = 10\text{k}\Omega$ , connected to ground, unless otherwise noted.



## APPLICATIONS INFORMATION

OPA137 series op amps are unity-gain stable and suitable for a wide range of general-purpose applications. Power supply pins should be bypassed with 10nF ceramic capacitors or larger. All circuitry is completely independent in dual and quad versions, assuring normal performance when one amplifier in a package is overdriven or short circuited. Many key parameters are guaranteed over the specified temperature range,  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ .

### OPERATING VOLTAGE

OPA137 op amps can be operated on power supplies as low as  $\pm 2.25\text{V}$ . Performance remains excellent with power supplies ranging from  $\pm 2.25\text{V}$  to  $\pm 18\text{V}$  ( $+4.5\text{V}$  to  $+36\text{V}$  single supply). Most parameters vary only slightly throughout this supply voltage range. Quiescent current and short-circuit current vs supply voltage are shown in Typical Performance Curves.

Operation at very low supply voltage ( $V_S \leq \pm 3\text{V}$ ) requires careful attention to ensure that the common-mode voltage remains within the linear range,  $V_{CM} = (V-) + 3\text{V}$  to  $(V+)$ . Inputs may need to be biased above ground in accordance with the common-mode voltage range restrictions for linear operation.

### INPUT VOLTAGE

The input common-mode voltage range of OPA137 series op amps extends from  $(V-) + 3\text{V}$  to the positive rail,  $V+$ . For normal operation, inputs should be limited to this range. The inputs may go beyond the power supplies without output phase-reversal. Many FET-input op amps (such as TL061 types) exhibit phase-reversal of the output when the input common-mode range is exceeded. This can occur in voltage-follower circuits, causing serious problems in control loop applications.

Input terminals are diode-clamped to the power supply rails for ESD protection. If the input voltage can exceed the negative supply by 500mV, input current should be limited to 2mA (or less). If the input current is not adequately limited, you may see unpredictable behavior in the other amplifiers in the package. This is easily accomplished with an input resistor as shown in Figure 1. Many input signals are inherently current-limited, therefore, a limiting resistor may not be required.

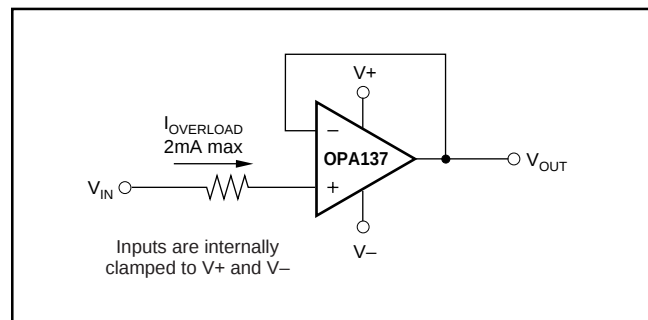


FIGURE 1. Input Current Protection for Voltages Exceeding the Supply Voltage.

## HIGH-SIDE CURRENT SENSING

Many applications require the sensing of signals near the positive supply. The common-mode input range of OPA137 op amps includes the positive rail, enabling them to be used to sense power supply currents as shown in Figure 2.

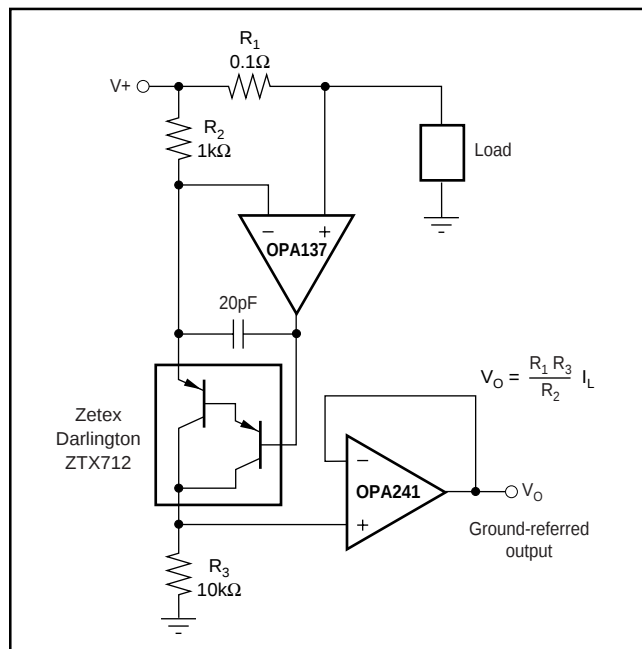


FIGURE 2. High-Side Current Monitor.

### INPUT BIAS CURRENT

The input bias current is approximately 5pA at room temperature and increases with temperature as shown in the typical performance curve "Input Bias Current vs Temperature."

Input Bias current also varies with common-mode voltage and power supply voltage. This variation is dependent on the voltage between the negative power supply and the common-mode input voltage. The effect is shown in the typical performance curve "Input Bias Current vs Common-Mode Voltage."

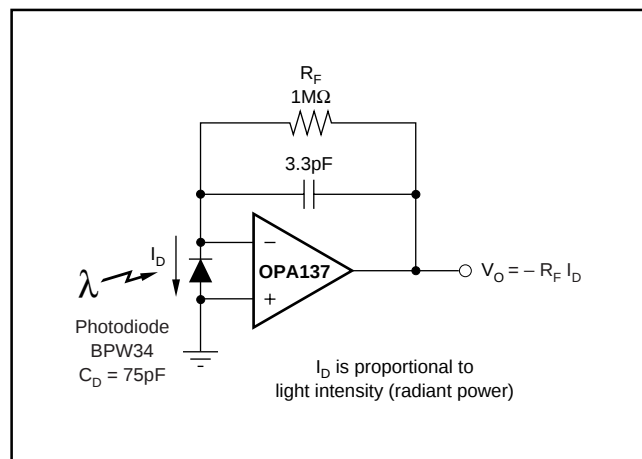
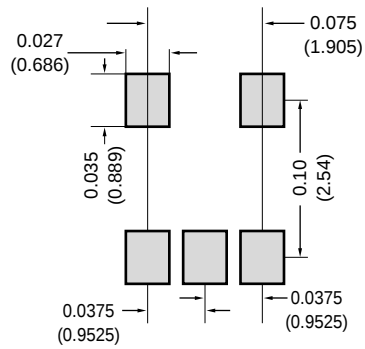
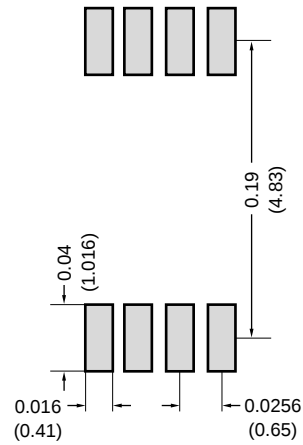


FIGURE 3. Photodetector Amplifier.

**SOT-23-5**  
(Package Drawing #331)



**MSOP-8**  
(Package Drawing #337)



Refer to end of data sheet or Appendix C of Burr-Brown Data Book for tolerances and detailed package drawing. For further information on solder pads for surface-mount devices consult Application Bulletin AB-132.

FIGURE 4. Recommended SOT-23-5 and MSOP-8 Solder Footprints.

**PACKAGING INFORMATION**

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup>    | Lead/<br>Ball Finish | MSL Peak Temp <sup>(3)</sup> | Samples<br>(Requires Login) |
|------------------|-----------------------|--------------|-----------------|------|-------------|----------------------------|----------------------|------------------------------|-----------------------------|
| OPA137N/250      | ACTIVE                | SOT-23       | DBV             | 5    | 250         | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |
| OPA137N/250E4    | ACTIVE                | SOT-23       | DBV             | 5    | 250         | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |
| OPA137N/3K       | ACTIVE                | SOT-23       | DBV             | 5    | 3000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |
| OPA137N/3KE4     | ACTIVE                | SOT-23       | DBV             | 5    | 3000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |
| OPA137NA/250     | ACTIVE                | SOT-23       | DBV             | 5    | 250         | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |
| OPA137NA/250E4   | ACTIVE                | SOT-23       | DBV             | 5    | 250         | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |
| OPA137NA/3K      | ACTIVE                | SOT-23       | DBV             | 5    | 3000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |
| OPA137NA/3KE4    | ACTIVE                | SOT-23       | DBV             | 5    | 3000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-2-260C-1 YEAR          |                             |
| OPA137P          | ACTIVE                | PDIP         | P               | 8    | 50          | Green (RoHS<br>& no Sb/Br) | CU SNPB              | N / A for Pkg Type           |                             |
| OPA137PA         | ACTIVE                | PDIP         | P               | 8    | 50          | Green (RoHS<br>& no Sb/Br) | CU SNPB              | N / A for Pkg Type           |                             |
| OPA137U          | ACTIVE                | SOIC         | D               | 8    | 75          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA137UA         | ACTIVE                | SOIC         | D               | 8    | 75          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA137UA/2K5     | ACTIVE                | SOIC         | D               | 8    | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA137UA/2K5G4   | ACTIVE                | SOIC         | D               | 8    | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA137UAG4       | ACTIVE                | SOIC         | D               | 8    | 75          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA137UE4        | ACTIVE                | SOIC         | D               | 8    | 75          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA2137E/250     | ACTIVE                | VSSOP        | DGK             | 8    | 250         | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup>    | Lead/<br>Ball Finish | MSL Peak Temp <sup>(3)</sup> | Samples<br>(Requires Login) |
|------------------|-----------------------|--------------|-----------------|------|-------------|----------------------------|----------------------|------------------------------|-----------------------------|
| OPA2137E/250G4   | ACTIVE                | VSSOP        | DGK             | 8    | 250         | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA2137E/2K5     | ACTIVE                | VSSOP        | DGK             | 8    | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA2137E/2K5G4   | ACTIVE                | VSSOP        | DGK             | 8    | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA2137EA/250    | ACTIVE                | VSSOP        | DGK             | 8    | 250         | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA2137EA/250G4  | ACTIVE                | VSSOP        | DGK             | 8    | 250         | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA2137EA/2K5    | ACTIVE                | VSSOP        | DGK             | 8    | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA2137EA/2K5G4  | ACTIVE                | VSSOP        | DGK             | 8    | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA2137P         | ACTIVE                | PDIP         | P               | 8    | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | N / A for Pkg Type           |                             |
| OPA2137PA        | ACTIVE                | PDIP         | P               | 8    | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | N / A for Pkg Type           |                             |
| OPA2137PAG4      | ACTIVE                | PDIP         | P               | 8    | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | N / A for Pkg Type           |                             |
| OPA2137PG4       | ACTIVE                | PDIP         | P               | 8    | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | N / A for Pkg Type           |                             |
| OPA2137U         | ACTIVE                | SOIC         | D               | 8    | 75          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA2137U/2K5     | ACTIVE                | SOIC         | D               | 8    | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA2137U/2K5E4   | ACTIVE                | SOIC         | D               | 8    | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA2137UA        | ACTIVE                | SOIC         | D               | 8    | 75          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA2137UA/2K5    | ACTIVE                | SOIC         | D               | 8    | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA2137UA/2K5E4  | PREVIEW               | SOIC         | D               | 8    |             | TBD                        | Call TI              | Call TI                      |                             |
| OPA2137UAE4      | ACTIVE                | SOIC         | D               | 8    | 75          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup>    | Lead/<br>Ball Finish | MSL Peak Temp <sup>(3)</sup> | Samples<br>(Requires Login) |
|------------------|-----------------------|--------------|-----------------|------|-------------|----------------------------|----------------------|------------------------------|-----------------------------|
| OPA2137UE4       | ACTIVE                | SOIC         | D               | 8    | 75          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA4137P         | ACTIVE                | PDIP         | N               | 14   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | N / A for Pkg Type           |                             |
| OPA4137PA        | ACTIVE                | PDIP         | N               | 14   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | N / A for Pkg Type           |                             |
| OPA4137PAG4      | ACTIVE                | PDIP         | N               | 14   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | N / A for Pkg Type           |                             |
| OPA4137PG4       | ACTIVE                | PDIP         | N               | 14   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | N / A for Pkg Type           |                             |
| OPA4137U         | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA4137U/2K5     | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA4137U/2K5E4   | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA4137UA        | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA4137UA/2K5    | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA4137UA/2K5G4  | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA4137UAE4      | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA4137UAG4      | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |
| OPA4137UE4       | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-3-260C-168 HR          |                             |

<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.

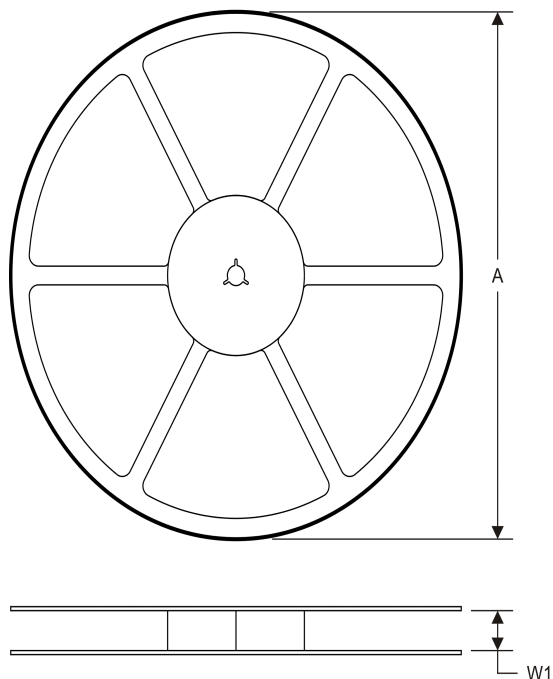
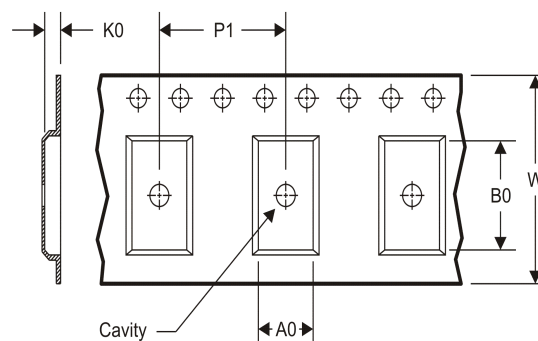
**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**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.

**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**
**REEL DIMENSIONS**

**TAPE DIMENSIONS**


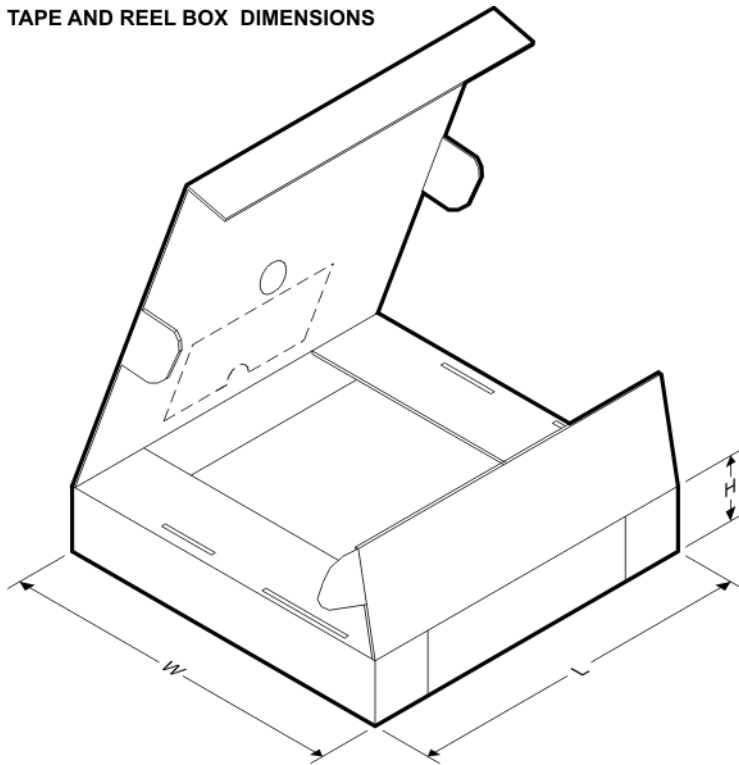
|    |                                                           |
|----|-----------------------------------------------------------|
| A0 | Dimension designed to accommodate the component width     |
| B0 | Dimension designed to accommodate the component length    |
| K0 | Dimension designed to accommodate the component thickness |
| W  | Overall width of the carrier tape                         |
| P1 | Pitch between successive cavity centers                   |

**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 |
|---------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| OPA137UA/2K5  | SOIC         | D               | 8    | 2500 | 330.0              | 12.4               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |
| OPA2137E/250  | VSSOP        | DGK             | 8    | 250  | 180.0              | 12.4               | 5.3     | 3.4     | 1.4     | 8.0     | 12.0   | Q1            |
| OPA2137E/2K5  | VSSOP        | DGK             | 8    | 2500 | 330.0              | 12.4               | 5.3     | 3.4     | 1.4     | 8.0     | 12.0   | Q1            |
| OPA2137EA/250 | VSSOP        | DGK             | 8    | 250  | 180.0              | 12.4               | 5.3     | 3.4     | 1.4     | 8.0     | 12.0   | Q1            |
| OPA2137EA/2K5 | VSSOP        | DGK             | 8    | 2500 | 330.0              | 12.4               | 5.3     | 3.4     | 1.4     | 8.0     | 12.0   | Q1            |
| OPA2137U/2K5  | SOIC         | D               | 8    | 2500 | 330.0              | 12.4               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |
| OPA2137UA/2K5 | SOIC         | D               | 8    | 2500 | 330.0              | 12.4               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |
| OPA4137U/2K5  | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| OPA4137UA/2K5 | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device        | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|---------------|--------------|-----------------|------|------|-------------|------------|-------------|
| OPA137UA/2K5  | SOIC         | D               | 8    | 2500 | 367.0       | 367.0      | 35.0        |
| OPA2137E/250  | VSSOP        | DGK             | 8    | 250  | 210.0       | 185.0      | 35.0        |
| OPA2137E/2K5  | VSSOP        | DGK             | 8    | 2500 | 367.0       | 367.0      | 35.0        |
| OPA2137EA/250 | VSSOP        | DGK             | 8    | 250  | 210.0       | 185.0      | 35.0        |
| OPA2137EA/2K5 | VSSOP        | DGK             | 8    | 2500 | 367.0       | 367.0      | 35.0        |
| OPA2137U/2K5  | SOIC         | D               | 8    | 2500 | 367.0       | 367.0      | 35.0        |
| OPA2137UA/2K5 | SOIC         | D               | 8    | 2500 | 367.0       | 367.0      | 35.0        |
| OPA4137U/2K5  | SOIC         | D               | 14   | 2500 | 367.0       | 367.0      | 38.0        |
| OPA4137UA/2K5 | SOIC         | D               | 14   | 2500 | 367.0       | 367.0      | 38.0        |

## 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 JESD46C and to discontinue any product or service per JESD48B. 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 which meet ISO/TS16949 requirements, mainly for automotive use. Components which have not been so designated are neither designed nor intended for automotive use; and TI will not be responsible for any failure of such components to meet such requirements.

### 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 Mobile 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)