

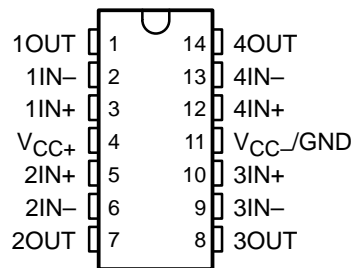
TL3474, TL3474A

HIGH-SLEW-RATE, SINGLE-SUPPLY OPERATIONAL AMPLIFIERS

SLVS461B – JANUARY 2003 – REVISED JULY 2003

- Low Offset . . . 3 mV (Max) for A-Grade
- Wide Gain-Bandwidth Product . . . 4 MHz
- High Slew Rate . . . 13 V/ μ s
- Fast Settling Time . . . 1.1 μ s to 0.1%
- Wide-Range Single-Supply Operation . . . 4 V to 36 V
- Wide Input Common-Mode Range Includes Ground (V_{CC-})
- Low Total Harmonic Distortion . . . 0.02%
- Large-Capacitance Drive Capability . . . 10,000 pF
- Output Short-Circuit Protection
- Alternative to MC33074/A and MC34074/A

D, N, OR PW PACKAGE
(TOP VIEW)



description/ordering information

ORDERING INFORMATION

| T_A | V_{IOmax} AT 25°C | PACKAGE† | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|--------------------------|--------------------------|--------------|--------------------------|---------------------|
| 0°C to 70°C | A-grade: 3 mV | PDIP (N) | Tube of 25 | TL3474ACN | TL3474ACN |
| | | SOIC (D) | Tube of 50 | TL3474ACD | TL3474A |
| | | | Reel of 2500 | TL3474ACDR | |
| | TSSOP (PW) | Tube of 90 | TL3474ACPW | T3474A | |
| | | Reel of 2000 | TL3474ACPWR | | |
| | 0°C to 70°C | Standard grade: 10 mV | PDIP (N) | Tube of 25 | TL3474CN |
| SOIC (D) | | | Tube of 50 | TL3474CD | TL3474C |
| | | | Reel of 2500 | TL3474CDR | |
| TSSOP (PW) | | Tube of 90 | TL3474CPW | TL3474 | |
| | | Reel of 2000 | TL3474CPWR | | |
| -40°C to 105°C | | A-grade: 3 mV | PDIP (N) | Tube of 25 | TL3474AIN |
| | SOIC (D) | | Tube of 50 | TL3474AID | TL3474AI |
| | | | Reel of 2500 | TL3474AIDR | |
| | TSSOP (PW) | Tube of 90 | TL3474AIPW | Z3474A | |
| | | Reel of 2000 | TL3474AIPWR | | |
| | Standard grade: 10 mV | PDIP (N) | Tube of 25 | TL3474IN | TL3474IN |
| | | SOIC (D) | Tube of 50 | TL3474ID | TL3474I |
| | | | Reel of 2500 | TL3474IDR | |
| | | TSSOP (PW) | Tube of 90 | TL3474IPW | Z3474 |
| Reel of 2000 | | | TL3474IPWR | | |

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS
INSTRUMENTS**

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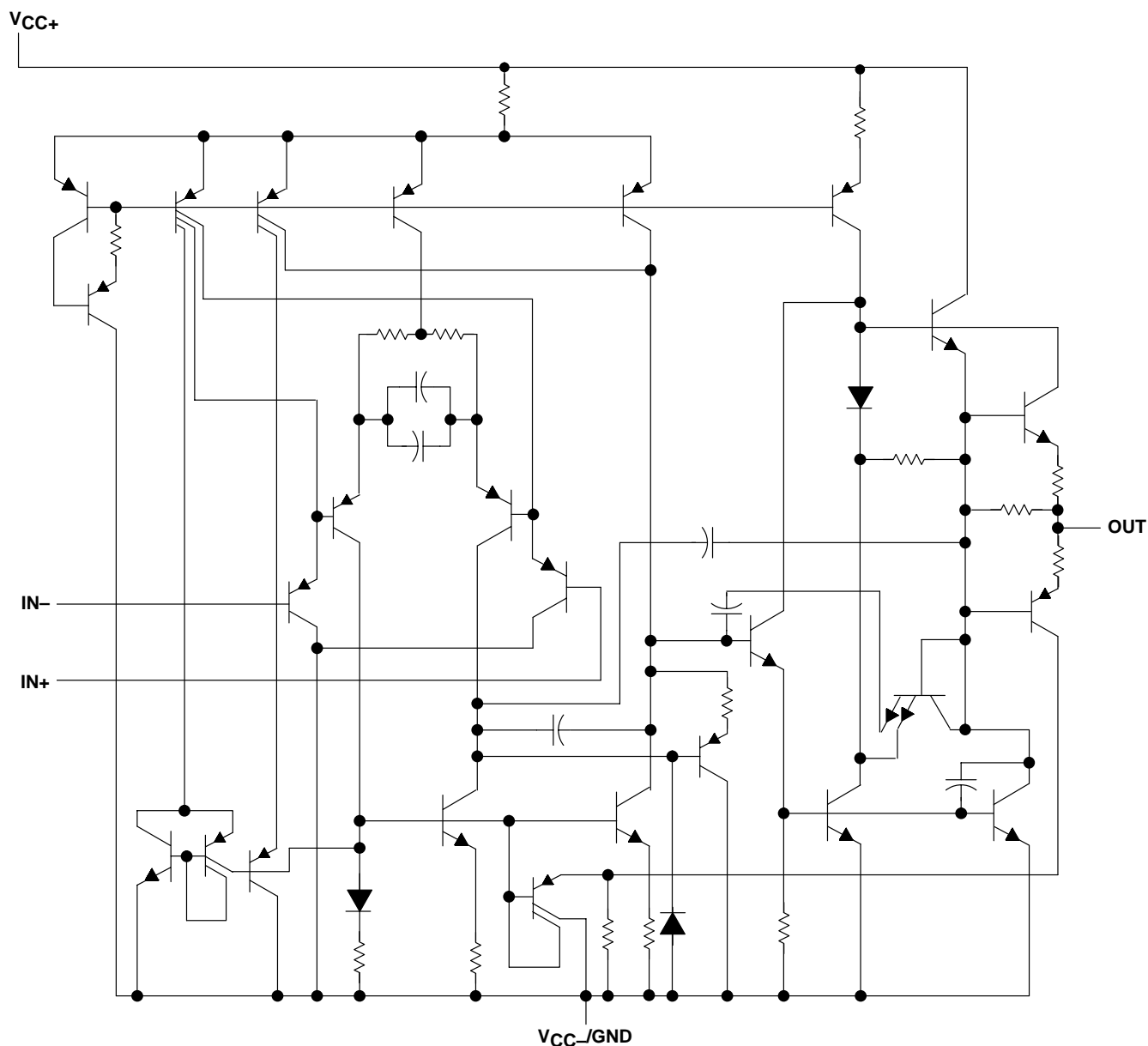
TL3474, TL3474A HIGH-SLEW-RATE, SINGLE-SUPPLY OPERATIONAL AMPLIFIERS

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description/ordering information (continued)

Quality, low-cost, bipolar fabrication with innovative design concepts is employed for the TL3474, TL3474A operational amplifiers. These devices offer 4 MHz of gain-bandwidth product, 13-V/ μ s slew rate, and fast settling time without the use of JFET device technology. Although the TL3474 and TL3474A can be operated from split supplies, they are particularly suited for single-supply operation because the common-mode input voltage range includes ground potential (V_{CC-}). With a Darlington transistor input stage, these devices exhibit high input resistance, low input offset voltage, and high gain. The all-npn output stage, characterized by no dead-band crossover distortion and large output voltage swing, provides high-capacitance drive capability, excellent phase and gain margins, low open-loop high-frequency output impedance, and symmetrical source/sink ac frequency response. These low-cost amplifiers are an alternative to the MC34074/A and MC33074/A operational amplifiers.

schematic (each amplifier)



TL3474, TL3474A

HIGH-SLEW-RATE, SINGLE-SUPPLY OPERATIONAL AMPLIFIERS

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absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

| | |
|---|----------------|
| Supply voltage: V_{CC+} (see Note 1) | 18 V |
| V_{CC-} | -18 V |
| Differential input voltage, V_{ID} (see Note 2) | ± 36 V |
| Input voltage, V_I (any input) | $V_{CC\pm}$ |
| Input current, I_I (each input) | ± 1 mA |
| Output current, I_O | ± 80 mA |
| Total current into V_{CC+} | 80 mA |
| Total current out of V_{CC-} | 80 mA |
| Duration of short-circuit current at (or below) 25°C (see Note 3) | Unlimited |
| Package thermal impedance, θ_{JA} (see Notes 4 and 5): D package | 86°C/W |
| N package | 80°C/W |
| PW package | 113°C/W |
| Operating virtual junction temperature, T_J | 150°C |
| Lead temperature 1.6 mm (1/16 inch) from case for 10 seconds | 260°C |
| Storage temperature range, T_{stg} | -65°C to 150°C |

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES:
1. All voltage values, except differential voltages, are with respect to the midpoint between V_{CC+} and V_{CC-}/GND .
 2. Differential voltages are at the noninverting input with respect to the inverting input. Excessive input current can flow when the input is less than $V_{CC-} - 0.3$ V.
 3. The output can be shorted to either supply. Temperature and/or supply voltages must be limited to ensure that the maximum dissipation rating is not exceeded.
 4. Maximum power dissipation is a function of $T_J(max)$, θ_{JA} , and T_A . The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(max) - T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
 5. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions

| | | MIN | MAX | UNIT | |
|-------------|--------------------------------|------------------------|-----|------|----|
| $V_{CC\pm}$ | Supply voltage | 4 | 36 | V | |
| V_{IC} | Common-mode input voltage | $V_{CC} = 5$ V | 0 | 2.8 | V |
| | | $V_{CC\pm} = \pm 15$ V | -15 | 12.8 | |
| T_A | Operating free-air temperature | TL3474C, TL3474AC | 0 | 70 | °C |
| | | TL3474I, TL3474AI | -40 | 105 | |



TL3474, TL3474A HIGH-SLEW-RATE, SINGLE-SUPPLY OPERATIONAL AMPLIFIERS

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electrical characteristics at specified free-air temperature, $V_{CC\pm} = \pm 15\text{ V}$ (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | T _A | TL3474 | | | TL3474A | | | UNIT |
|--|---|-------------------------|-------------|-------|-------------|---------|------|-------|------|
| | | | MIN | TYP† | MAX | MIN | TYP† | MAX | |
| V _{IO} Input offset voltage | V _{IC} = 0, V _O = 0, R _S = 50 Ω | V _{CC} = 5 V | 25°C | 1.5 | 10 | 1.5 | 3 | mV | |
| | | V _{CC} = ±15 V | 25°C | 1.0 | 10 | 1.0 | 3 | | |
| | | | Full range‡ | | | 12 | | | 5 |
| αV _{IO} Temperature coefficient of input offset voltage | | V _{CC} = ±15 V | Full range‡ | | 10 | | 10 | μV/°C | |
| I _{IO} Input offset current | | V _{CC} = ±15 V | 25°C | 6 | 75 | 6 | 75 | nA | |
| | | | Full range‡ | | 300 | | 300 | | |
| I _{IB} Input bias current | V _{CC} = ±15 V | 25°C | 100 | 500 | 100 | 500 | nA | | |
| | | Full range‡ | | 700 | | 700 | | | |
| V _{ICR} Common-mode input voltage range | R _S = 50 Ω | 25°C | -15 to 12.8 | | -15 to 12.8 | | V | | |
| | | Full range‡ | -15 to 12.8 | | -15 to 12.8 | | | | |
| V _{OH} High-level output voltage | V _{CC+} = 5 V, V _{CC-} = 0, R _L = 2 kΩ | 25°C | 3.7 | 4 | 3.7 | 4 | V | | |
| | R _L = 10 kΩ | 25°C | 13.6 | 14 | 13.6 | 14 | | | |
| | R _L = 2 kΩ | Full range‡ | | 13.4 | | 13.4 | | | |
| V _{OL} Low-level output voltage | V _{CC+} = 5 V, V _{CC-} = 0, R _L = 2 kΩ | 25°C | 0.1 | 0.3 | 0.1 | 0.3 | V | | |
| | R _L = 10 kΩ | 25°C | -14.7 | -14.3 | -14.7 | -14.3 | | | |
| | R _L = 2 kΩ | Full range‡ | | -13.5 | | -13.5 | | | |
| A _{VD} Large-signal differential voltage amplification | V _O = ±10 V, R _L = 2 kΩ | 25°C | 25 | 100 | 25 | 100 | V/mV | | |
| | | Full range‡ | | 20 | | 20 | | | |
| I _{OS} Short-circuit output current | Source: V _{ID} = 1 V, V _O = 0 | 25°C | -10 | -34 | -10 | -34 | mA | | |
| | Sink: V _{ID} = -1 V, V _O = 0 | | 20 | 27 | 20 | 27 | | | |
| CMRR Common-mode rejection ratio | V _{IC} = V _{ICR} (min), R _S = 50 Ω | 25°C | 65 | 97 | 80 | 97 | dB | | |
| k _{SVR} Supply-voltage rejection ratio (ΔV _{CC±} /ΔV _{IO}) | V _{CC±} = ±13.5 V to ±16.5 V, R _S = 100 Ω | 25°C | 70 | 97 | 70 | 97 | dB | | |
| I _{CC} Supply current (per channel) | V _O = 0, No load | 25°C | 3.5 | 4.5 | 3.5 | 4.5 | mA | | |
| | | Full range‡ | 4.5 | 5.5 | 4.5 | 5.5 | | | |
| | V _{CC+} = 5 V, V _O = 2.5 V, V _{CC-} = 0, No load | 25°C | 3.5 | 4.5 | 3.5 | 4.5 | | | |

† All typical values are at T_A = 25°C.

‡ Full range is 0°C to 70°C for the TL3474C, TL3474AC devices and -40°C to 105°C for the TL3474I, TL3474AI devices.



TL3474, TL3474A

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operating characteristics, $V_{CC\pm} = \pm 15\text{ V}$, $T_A = 25^\circ\text{C}$

| PARAMETER | | TEST CONDITIONS | | TL3474 | | | TL3474A | | | UNIT |
|-----------|--------------------------------|--|-----------------------|--------|------|-----|---------|-----|------------------------------|------|
| | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR+ | Positive slew rate | $V_I = -10\text{ V to } 10\text{ V}$, $R_L = 2\text{ k}\Omega$, $C_L = 300\text{ pF}$ | $A_V = 1$ | 8 | 10 | | 8 | 10 | $\text{V}/\mu\text{s}$ | |
| SR- | Negative slew rate | | $A_V = -1$ | | | | 13 | 13 | | |
| t_s | Settling time | $A_{VD} = -1$, 10-V step | To 0.1% | | 1.1 | | 1.1 | | μs | |
| | | | To 0.01% | | 2.2 | | 2.2 | | | |
| V_n | Equivalent input noise voltage | $f = 1\text{ kHz}$, | $R_S = 100\ \Omega$ | | 49 | | 49 | | $\text{nV}/\sqrt{\text{Hz}}$ | |
| I_n | Equivalent input noise current | $f = 1\text{ kHz}$ | | | 0.22 | | 0.22 | | $\text{pA}/\sqrt{\text{Hz}}$ | |
| THD | Total harmonic distortion | $V_{O(PP)} = 2\text{ V to } 20\text{ V}$, $R_L = 2\text{ k}\Omega$, $A_{VD} = 10$, $f = 10\text{ kHz}$ | | | 0.02 | | 0.02 | | % | |
| GBW | Gain-bandwidth product | $f = 100\text{ kHz}$ | | 3 | 4 | | 3 | 4 | MHz | |
| BW | Power bandwidth | $V_{O(PP)} = 20\text{ V}$, $R_L = 2\text{ k}\Omega$, $A_{VD} = 1$, THD = 5.0% | | | 160 | | 160 | | kHz | |
| ϕ_m | Phase margin | $R_L = 2\text{ k}\Omega$, | $C_L = 0$ | | 70 | | 70 | | deg | |
| | | $R_L = 2\text{ k}\Omega$, | $C_L = 300\text{ pF}$ | | 50 | | 50 | | | |
| | Gain margin | $R_L = 2\text{ k}\Omega$, | $C_L = 0$ | | 12 | | 12 | | dB | |
| | | $R_L = 2\text{ k}\Omega$, | $C_L = 300\text{ pF}$ | | 4 | | 4 | | | |
| r_i | Differential input resistance | $V_{IC} = 0$ | | | 150 | | 150 | | $\text{M}\Omega$ | |
| C_i | Input capacitance | $V_{IC} = 0$ | | | 2.5 | | 2.5 | | pF | |
| | Channel separation | $f = 10\text{ kHz}$ | | | 101 | | 101 | | dB | |
| z_o | Open-loop output impedance | $f = 1\text{ MHz}$, | $A_V = 1$ | | 20 | | 20 | | Ω | |

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TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

**OUTPUT IMPEDANCE
vs
FREQUENCY**

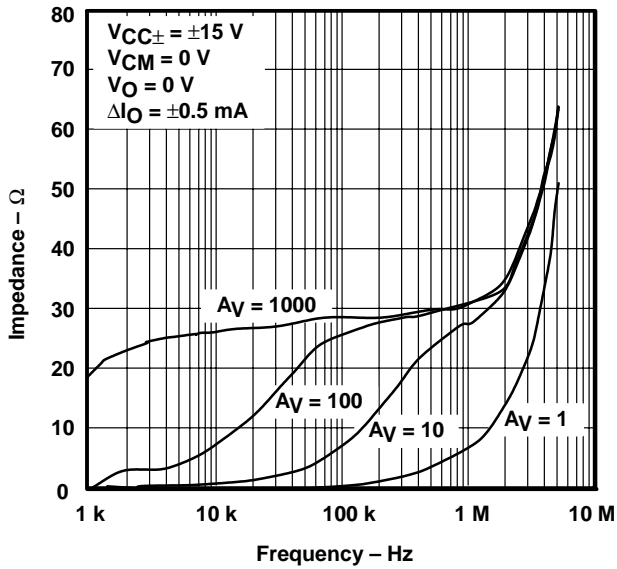


Figure 1

**TOTAL HARMONIC DISTORTION
vs
FREQUENCY**

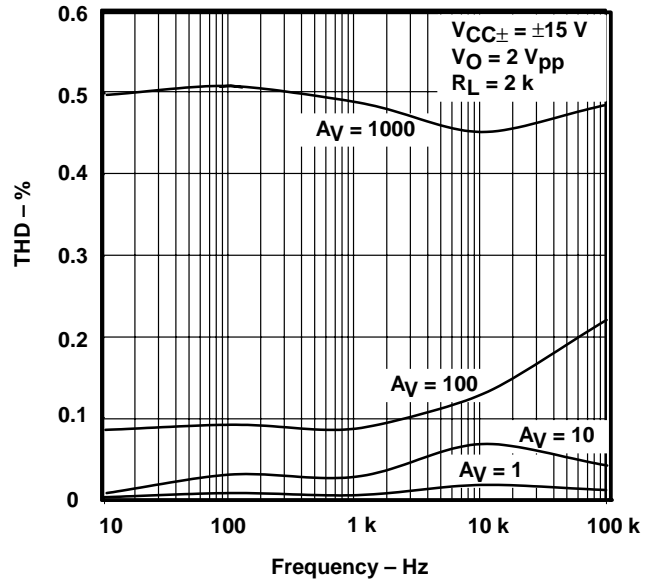


Figure 2

**GAIN AND PHASE
vs
FREQUENCY**

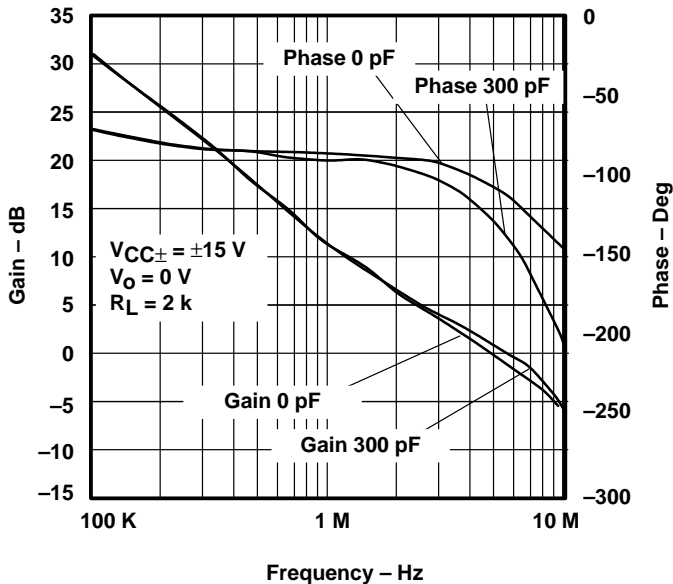


Figure 3

**NORMALIZED INPUT BIAS CURRENT
vs
TEMPERATURE**

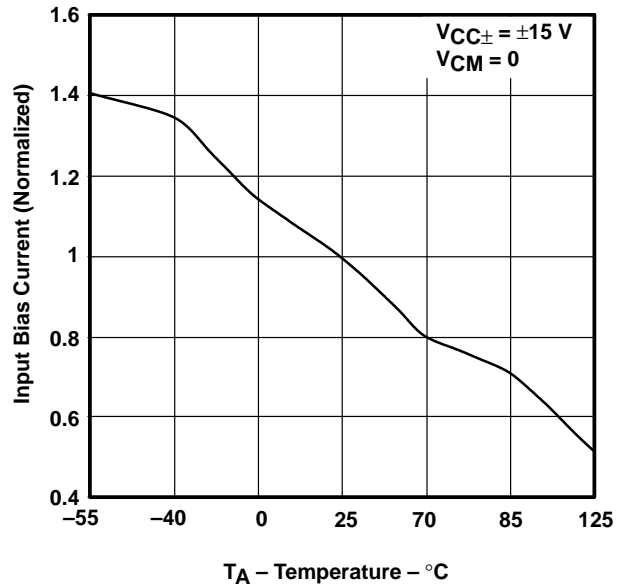


Figure 4



TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

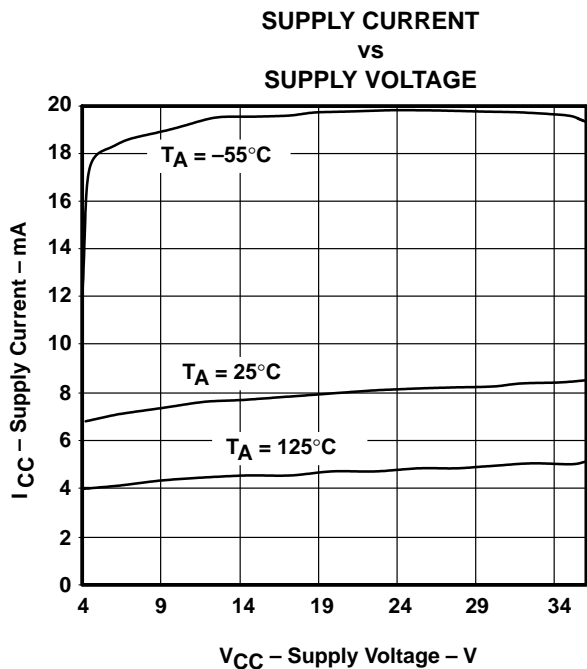


Figure 5

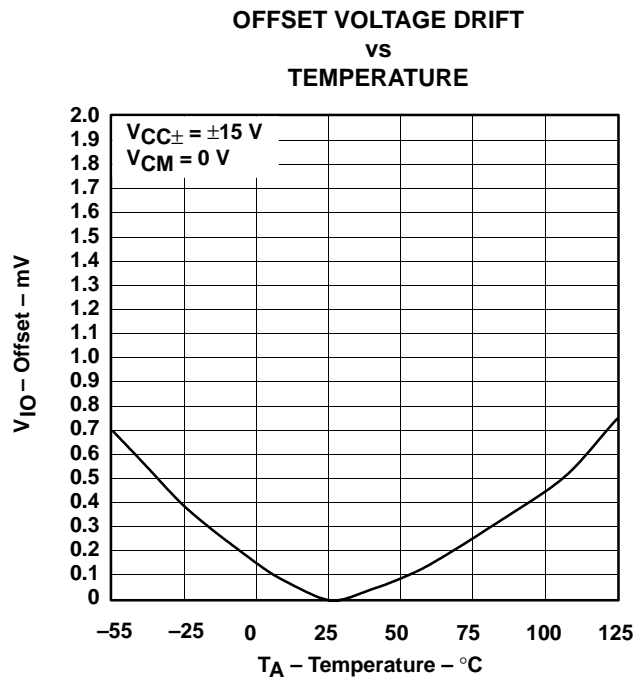


Figure 6

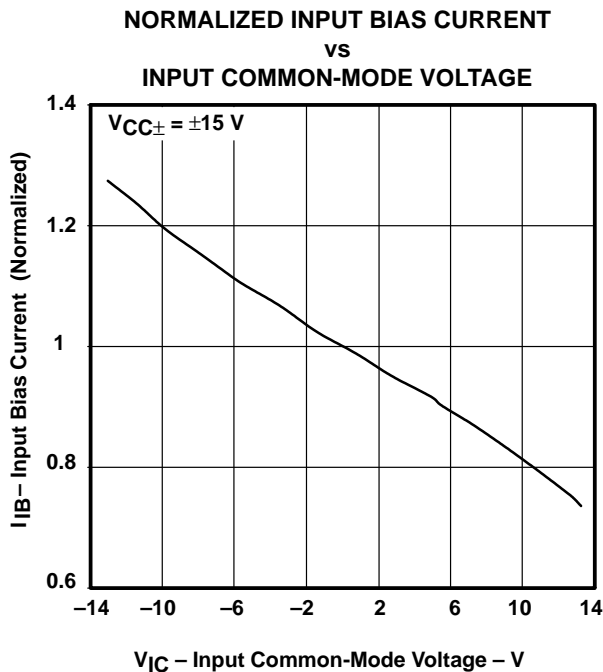


Figure 7

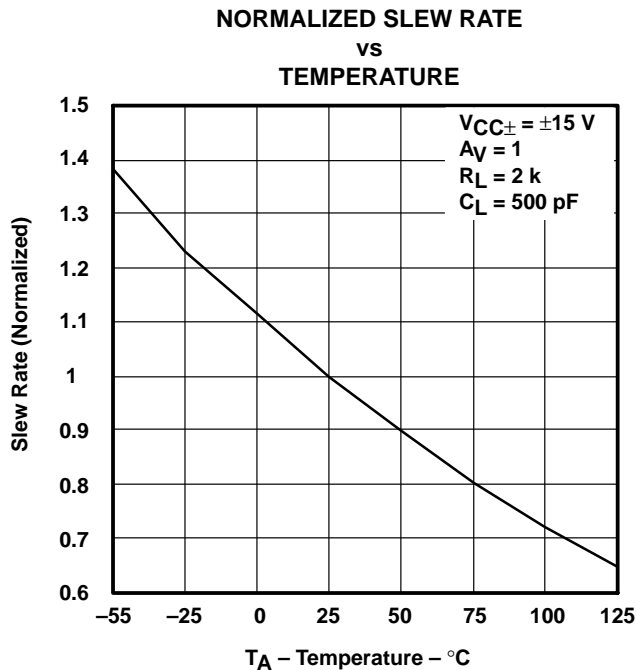


Figure 8

TL3474, TL3474A HIGH-SLEW-RATE, SINGLE-SUPPLY OPERATIONAL AMPLIFIERS

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TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

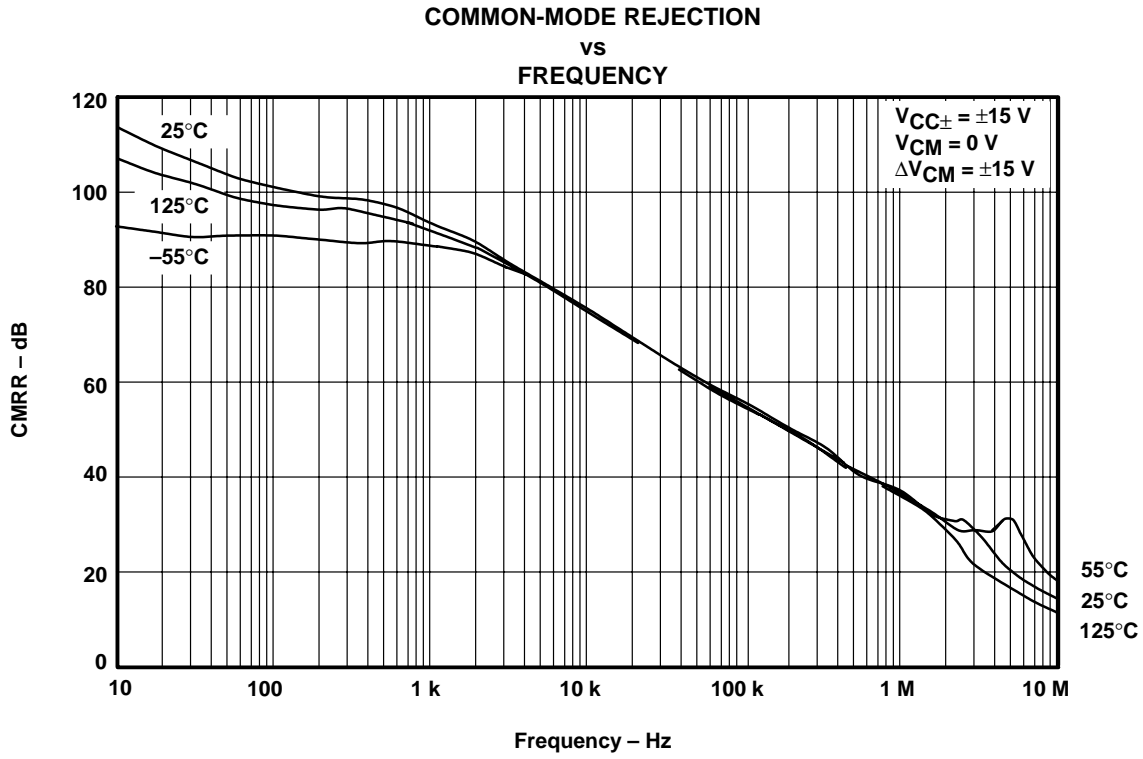


Figure 9

PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| TL3474ACD | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474ACDE4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474ACDR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474ACDRE4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474ACN | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TL3474ACNE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TL3474ACPW | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474ACPWE4 | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474ACPWR | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474ACPWRE4 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474AID | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474AIDE4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474AIDG4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474AIDR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474AIDRE4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474AIDRG4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474AIN | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TL3474AINE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TL3474AIPW | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474AIPWE4 | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474AIPWR | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474AIPWRE4 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474CD | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474CDE4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474CDR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| TL3474CDRE4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474CN | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TL3474CNE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TL3474CPW | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474CPWE4 | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474CPWR | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474CPWRE4 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474ID | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474IDE4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474IDR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474IDRE4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474IN | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TL3474INE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TL3474IPW | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474IPWE4 | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474IPWR | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TL3474IPWRE4 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |

⁽¹⁾ 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.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) 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.

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)

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

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N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



4040049/E 12/2002

- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - $\triangle C$ Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - $\triangle D$ The 20 pin end lead shoulder width is a vendor option, either half or full width.

D (R-PDSO-G14)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 - D. Falls within JEDEC MS-012 variation AB.

PW (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
 D. Falls within JEDEC MO-153

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