- **Direct Upgrades to TL05x, TL07x, and TL08x BiFET Operational Amplifiers**
- **Greater Than 2× Bandwidth (10 MHz) and 3× Slew Rate (45 V/μs) Than TL08x**
- **On-Chip Offset Voltage Trimming for Improved DC Performance**
- **Wider Supply Rails Increase Dynamic Signal Range to ±19 V**

## description

The TLE208x series of JFET-input operational amplifiers more than double the bandwidth and triple the slew rate of the TL07x and TL08x families of BiFET operational amplifiers. The TLE208x also have wider supply-voltage rails, increasing the dynamic-signal range for BiFET circuits to ±19 V. On-chip zener trimming of offset voltage yields precision grades for greater accuracy in dc-coupled applications. The TLE208x are pin-compatible with lower performance BiFET operational amplifiers for ease in improving performance in existing designs.

BiFET operational amplifiers offer the inherently higher input impedance of the JFET-input transistors, without sacrificing the output drive associated with bipolar amplifiers. This makes these amplifiers better suited for interfacing with high-impedance sensors or very low level ac signals. They also feature inherently better ac response than bipolar or CMOS devices having comparable power consumption.

Because BiFET operational amplifiers are designed for use with dual power supplies, care must be taken to observe common-mode input-voltage limits and output voltage swing when operating from a single supply. DC biasing of the input signal is required and loads should be terminated to a virtual ground node at mid-supply. Texas Instruments TLE2426 integrated virtual ground generator is useful when operating BiFET amplifiers from single supplies.

The TLE208x are fully specified at ±15 V and ±5 V. For operation in low-voltage and/or single-supply systems, Texas Instruments LinCMOS™ families of operational amplifiers (TLC- and TLV-prefix) are recommended. When moving from BiFET to CMOS amplifiers, particular attention should be paid to slew rate and bandwidth requirements and output loading.

For BiFET circuits requiring low noise and/or tighter dc precision, the TLE207x offer the same ac response as the TLE208x with more stringent dc and noise specifications.

**TLE2081 AVAILABLE OPTIONS**

| $T_A$ | $V_{IO}$max AT 25°C | PACKAGED DEVICES | | | | CHIP FORM (Y) |
|---|---|---|---|---|---|---|
| | | SMALL OUTLINE (D) | CHIP CARRIER (FK) | CERAMIC DIP (JG) | PLASTIC DIP (P) | |
| 0°C to 70°C | 3 mV<br>6 mV | TLE2081ACD<br>TLE2081CD | — | — | TLE2081ACP<br>TLE2081CP | —<br>TLE2081Y |
| –40°C to 85°C | 3 mV<br>6 mV | TLE2081AID<br>TLE2081ID | — | — | TLE2081AIP<br>TLE2081IP | — |
| –55°C to 125°C | 3 mV<br>6 mV | — | TLE2081AMFK<br>TLE2081MFK | TLE2081AMJG<br>TLE2081MJG | — | — |

† The D packages are available taped and reeled. Add R suffix to device type (e.g., TLE2081ACDR).
‡ Chip forms are tested at $T_A$ = 25°C only.

**TLE2082 AVAILABLE OPTIONS**

| $T_A$ | $V_{IO}$max AT 25°C | PACKAGED DEVICES | | | | CHIP FORM (Y) |
|---|---|---|---|---|---|---|
| | | SMALL OUTLINE (D) | CHIP CARRIER (FK) | CERAMIC DIP (JG) | PLASTIC DIP (P) | |
| 0°C to 70°C | 4 mV<br>7 mV | TLE2082ACD<br>TLE2082CD | — | — | TLE2082ACP<br>TLE2082CP | — |
| –40°C to 85°C | 4 mV<br>7 mV | TLE2082AID<br>TLE2082ID | — | — | TLE2082AIP<br>TLE2082IP | TLE2082Y |
| –55°C to 125°C | 4 mV<br>7 mV | TLE2082AMD<br>TLE2082MD | TLE2082AMFK<br>TLE2082MFK | TLE2082AMJG<br>TLE2082MJG | TLE2082AMP<br>TLE2082MP | — |

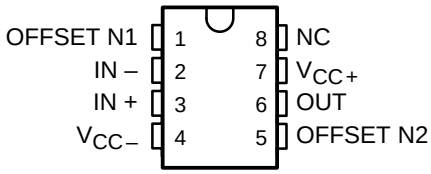
‡ The D packages are available taped and reeled. Add R suffix to device type (e.g., TLE2082ACDR).
‡ Chip forms are tested at $T_A$ = 25°C only.

**TLE2084 AVAILABLE OPTIONS**

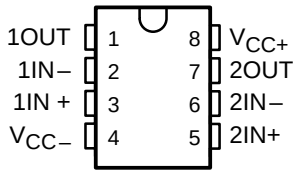
| $T_A$ | $V_{IO}$max AT 25°C | PACKAGED DEVICES | | | | CHIP FORM (Y) |
|---|---|---|---|---|---|---|
| | | SMALL OUTLINE (DW) | CHIP CARRIER (FK) | CERAMIC DIP (J) | PLASTIC DIP (N) | |
| 0°C to 70°C | 4 mV<br>7 mV | TLE2084ACDW<br>TLE2084CDW | — | — | TLE2084ACN<br>TLE2084CN | —<br>TLE2084Y |
| –55°C to 125°C | 4 mV<br>7 mV | — | TLE2084AMFK<br>TLE2084MFK | TLE2084AMJ<br>TLE2084MJ | — | — |

† The DW packages are available taped and reeled. Add R suffix to device type (e.g., TLE2084ACDWR).
‡ Chip forms are tested at $T_A$ = 25°C only.

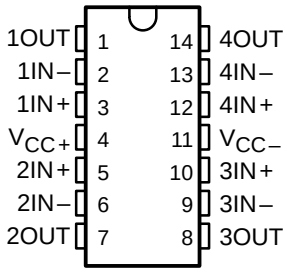
**TLE2081**
**D, JG, OR P PACKAGE**
**(TOP VIEW)**



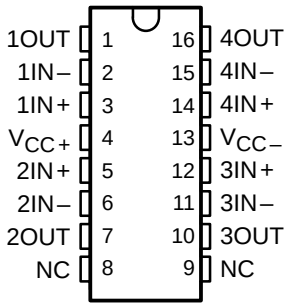

**TLE2082**
**D, JG, OR P PACKAGE**
**(TOP VIEW)**



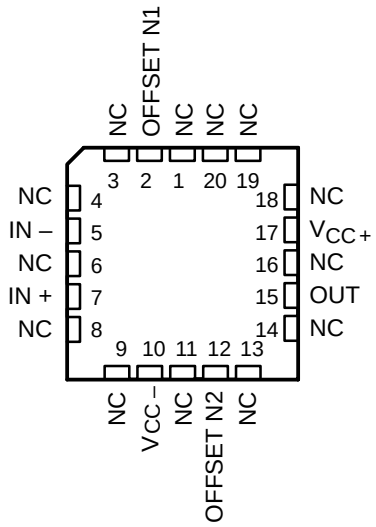

**TLE2084**
**J OR N PACKAGE**
**(TOP VIEW)**



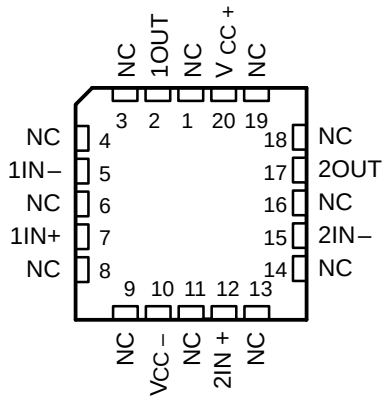

**TLE2084**
**DW PACKAGE**
**(TOP VIEW)**



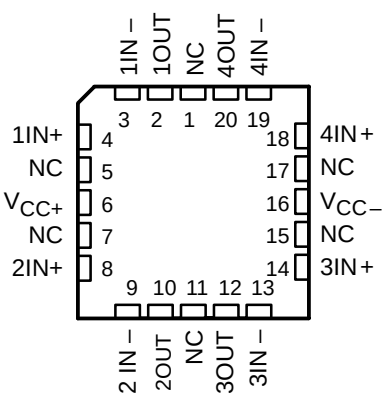

**TLE2081**
**FK PACKAGE**
**(TOP VIEW)**




**TLE2082**
**FK PACKAGE**
**(TOP VIEW)**

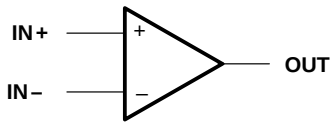



**TLE2084**
**FK PACKAGE**
**(TOP VIEW)**




NC – No internal connection

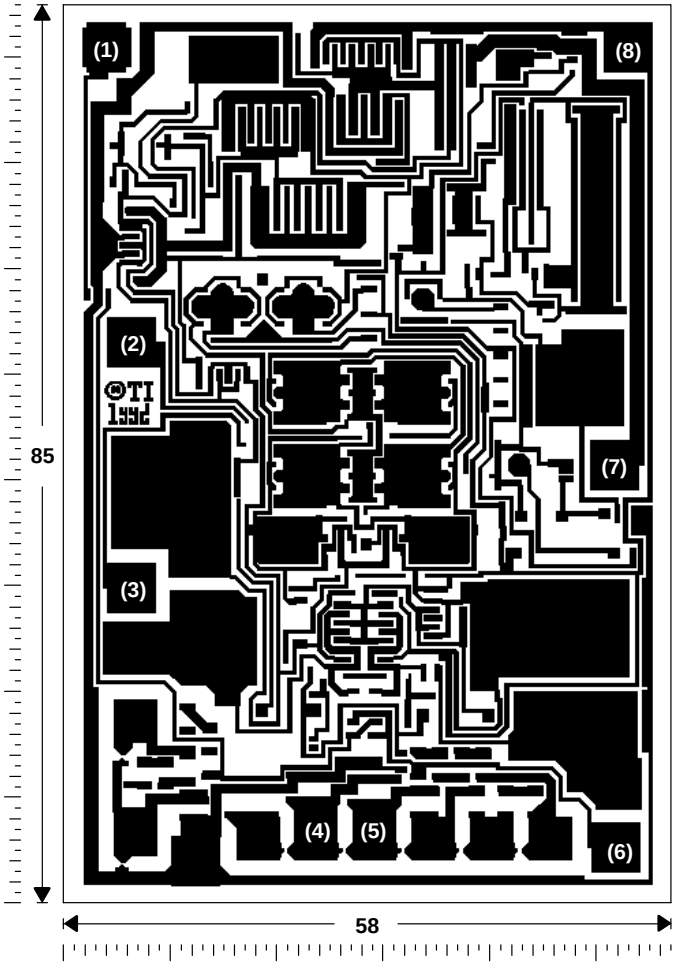
## symbol

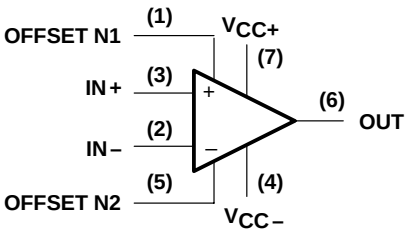


## TLE2081Y chip information

This chip, when properly assembled, displays characteristics similar to the TLE2081. Thermal compression or ultrasonic bonding may be used on the doped-aluminum bonding pads. Chips may be mounted with conductive epoxy or a gold-silicon preform.

**BONDING PAD ASSIGNMENTS**




**CHIP THICKNESS: 15 TYPICAL**

**BONDING PADS: 4 × 4 MINIMUM**

**$T_J$max = 150°C**

**TOLERANCES ARE ±10%.**

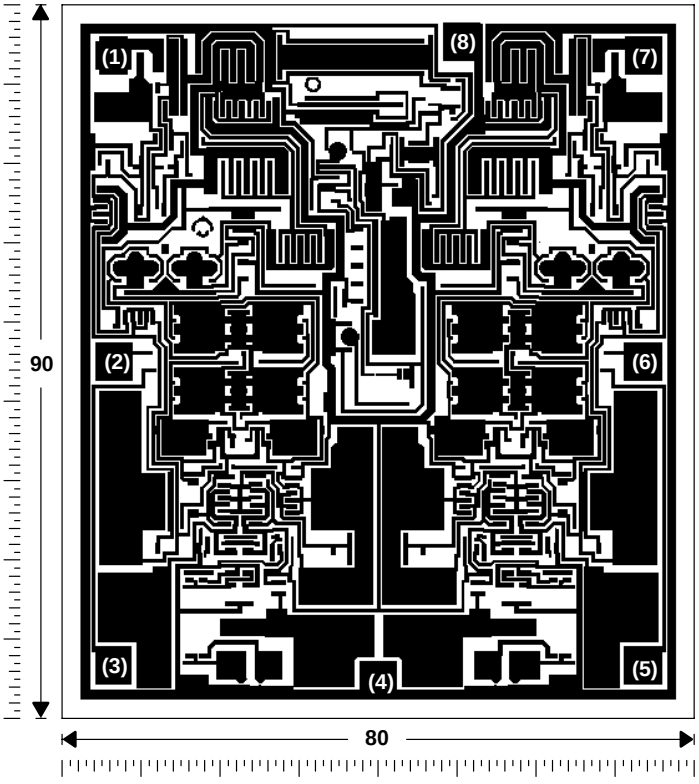
**ALL DIMENSIONS ARE IN MILS.**

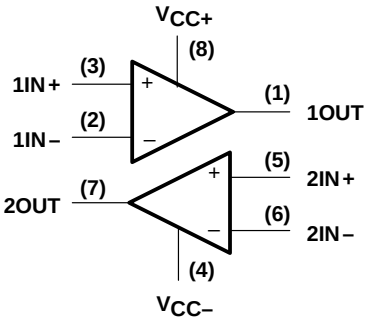
**PIN (4) IS INTERNALLY CONNECTED TO BACKSIDE OF THE CHIP.**

## TLE2082Y chip information

This chip, when properly assembled, displays characteristics similar to the TLE2082. Thermal compression or ultrasonic bonding may be used on the doped-aluminum bonding pads. Chips may be mounted with conductive epoxy or a gold-silicon preform.

**BONDING PAD ASSIGNMENTS**




**CHIP THICKNESS: 15 TYPICAL**

**BONDING PADS: 4 × 4 MINIMUM**

**$T_J$max = 150°C**

**TOLERANCES ARE ±10%.**

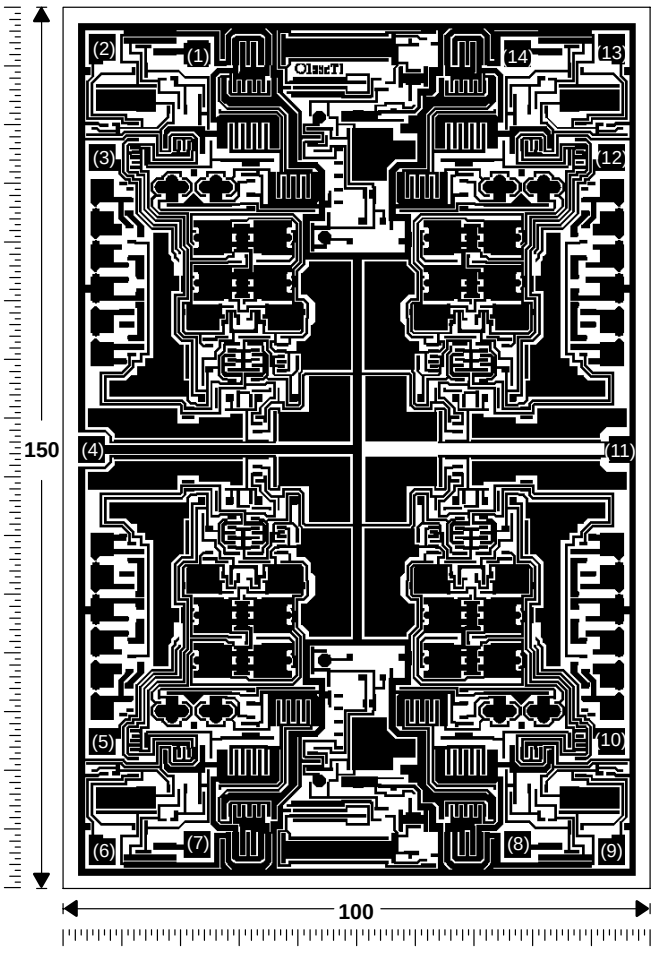
**ALL DIMENSIONS ARE IN MILS.**

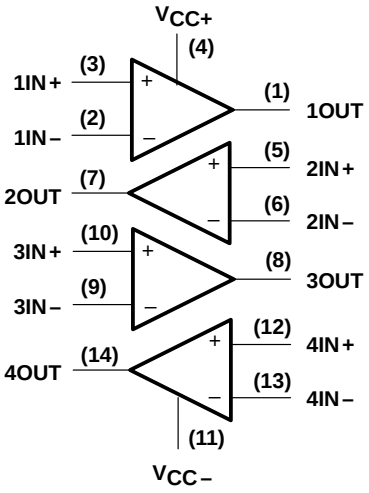
**PIN (4) IS INTERNALLY CONNECTED TO BACKSIDE OF THE CHIP.**

## TLE2084Y chip information

This chip, when properly assembled, displays characteristics similar to the TLE2084. Thermal compression or ultrasonic bonding may be used on the doped-aluminum bonding pads. Chips may be mounted with conductive epoxy or a gold-silicon preform.

**BONDING PAD ASSIGNMENTS**




**CHIP THICKNESS: 15 TYPICAL**

**BONDING PADS: 4 × 4 MINIMUM**

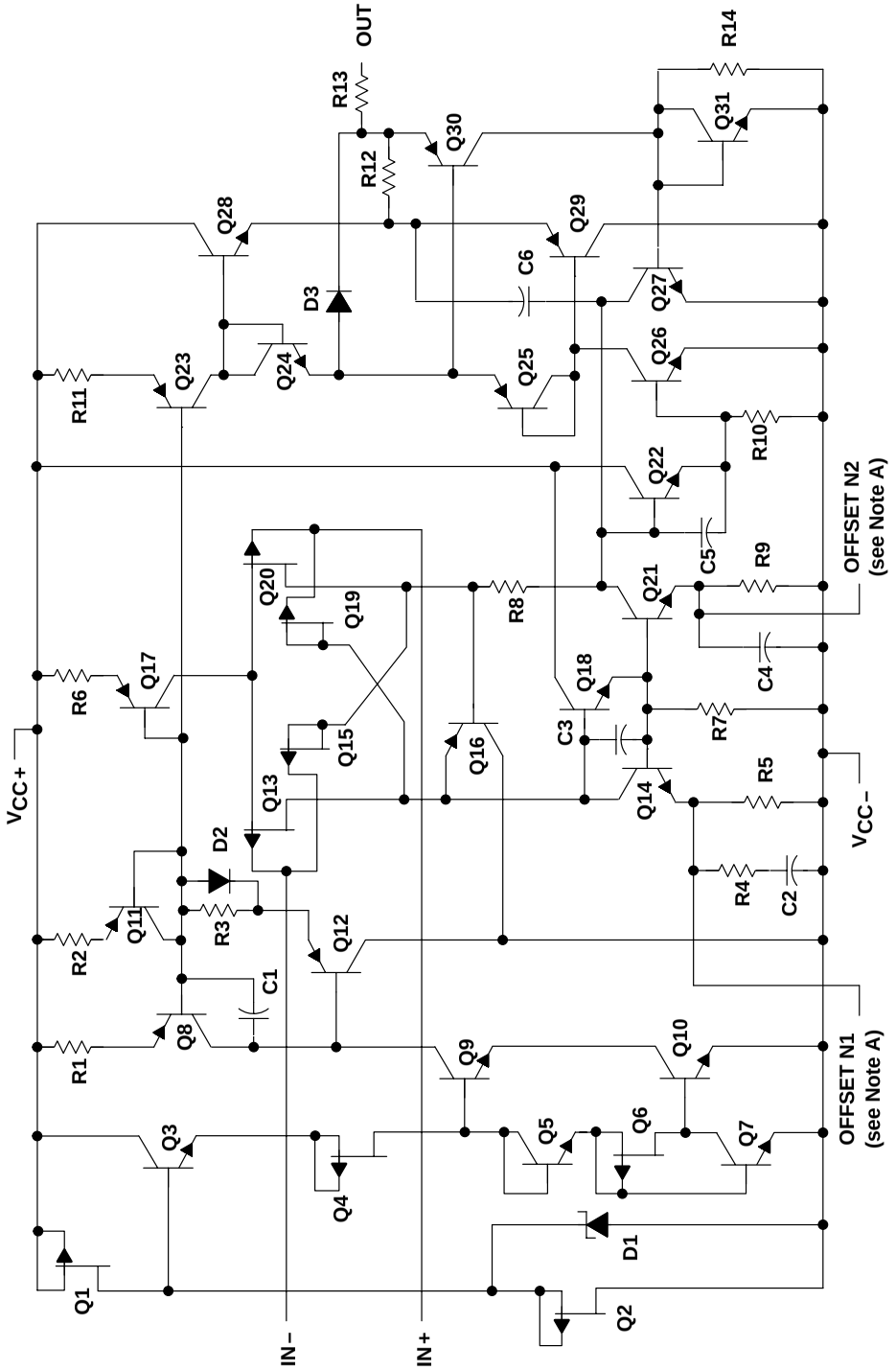
**$T_J$max = 150°C**

**TOLERANCES ARE ±10%.**

**ALL DIMENSIONS ARE IN MILS.**

**PIN (11) IS INTERNALLY CONNECTED TO BACKSIDE OF THE CHIP.**

## equivalent schematic (each channel)




NOTE A: OFFSET N1 and OFFSET N2 are only availiable on the TLE2081x devices.

| ACTUAL DEVICE COMPONENT COUNT | | | |
|---|---|---|---|
| COMPONENT | TLE2081 | TLE2082 | TLE2084 |
| Transistors | 33 | 57 | 114 |
| Resistors | 25 | 37 | 74 |
| Diodes | 8 | 5 | 10 |
| Capacitors | 6 | 11 | 22 |

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

Supply voltage, $V_{CC+}$ (see Note 1) . . . . . 19 V
Supply voltage, $V_{CC-}$ (see Note 1) . . . . . –19 V
Differential input voltage range, $V_{ID}$ (see Note 2) . . . . . $V_{CC+}$ to $V_{CC-}$
Input voltage range, $V_I$ (any input) . . . . . $V_{CC+}$ to $V_{CC-}$
Input current, $I_I$ (each input) . . . . . ±1 mA
Output current, $I_O$ (each output) . . . . . ±80 mA
Total current into $V_{CC+}$ . . . . . 160 mA
Total current out of $V_{CC-}$ . . . . . 160 mA
Duration of short-circuit current at (or below) 25°C (see Note 3) . . . . . unlimited
Continuous total dissipation . . . . . See Dissipation Rating Table
Operating free-air temperature range, $T_A$: C suffix . . . . . 0°C to 70°C
I suffix . . . . . –40°C to 85°C
M suffix . . . . . –55°C to 125°C
Storage temperature range . . . . . –65°C to 150°C
Case temperature for 60 seconds: FK package . . . . . 260°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: DW or N package . . . . . 260°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: J package . . . . . 300°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 $V_{CC-}$.
2. Differential voltages are at IN+ with respect to IN–.
3. The output can be shorted to either supply. Temperatures and/or supply voltages must be limited to ensure that the maximum dissipation rate is not exceeded.

**DISSIPATION RATING TABLE**

| PACKAGE | $T_A \le 25°C$ POWER RATING | DERATING FACTOR ABOVE $T_A = 25°C$ | $T_A = 70°C$ POWER RATING | $T_A = 85°C$ POWER RATING | $T_A = 125°C$ POWER RATING |
|---|---|---|---|---|---|
| D | 725 mW | 5.8 mW/°C | 464 mW | 377 mW | 145 mW |
| DW | 1025 mW | 8.2 mW/°C | 656 mW | 533 mW | 205 mW |
| FK | 1375 mW | 11.0 mW/°C | 880 mW | 715 mW | 275 mW |
| J | 1375 mW | 11.0 mW/°C | 880 mW | 715 mW | 275 mW |
| JG | 1050 mW | 8.4 mW/°C | 672 mW | 546 mW | 210 mW |
| N | 1150 mW | 9.2 mW/°C | 736 mW | 598 mW | 230 mW |
| P | 1000 mW | 8.0 mW/°C | 640 mW | 344 mW | 200 mW |

### recommended operating conditions

| | | C SUFFIX | | I SUFFIX | | M SUFFIX | | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | MIN | MAX | MIN | MAX | MIN | MAX | |
| Supply voltage, $V_{CC\pm}$ | | ±2.25 | ±19 | ±2.25 | ±19 | ±2.25 | ±19 | V |
| Common-mode input voltage, $V_{IC}$ | $V_{CC\pm}$ = ±5 V | –0.9 | 5 | –0.8 | 5 | –0.8 | 5 | V |
| | $V_{CC\pm}$ = ±15 V | –10.9 | 15 | –10.8 | 15 | –10.8 | 15 | |
| Operating free-air temperature, $T_A$ | | 0 | 70 | –40 | 85 | –55 | 125 | °C |

## TLE2081C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081C | | | TLE2081AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{IC}$ = 0, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | | 0.34 | 6 | | 0.3 | 3 | mV |
| | | | | Full range | | | 8 | | | 5 | |
| $\alpha_{VIO}$ | Temperature coefficient of input offset voltage | | | Full range | | 3.2 | 29 | | 3.2 | 29 | µV/°C |
| $I_{IO}$ | Input offset current | $V_{IC}$ = 0, $V_O$ = 0, See Figure 4 | | 25°C | | 5 | 100 | | 5 | 100 | nA |
| | | | | Full range | | | 1.4 | | | 1.4 | |
| $I_{IB}$ | Input bias current | | | 25°C | | 15 | 175 | | 15 | 175 | nA |
| | | | | Full range | | | 5 | | | 5 | |
| $V_{ICR}$ | Common-mode input voltage range | $R_S$ = 50 Ω | | 25°C | 5 to −1 | 5 to −1.9 | | 5 to −1 | 5 to −1.9 | | V |
| | | | | Full range | 5 to −0.9 | | | 5 to −0.9 | | | |
| $V_{OM+}$ | Maximum positive peak output voltage swing | $I_O$ = −200 µA | | 25°C | 3.8 | 4.1 | | 3.8 | 4.1 | | V |
| | | | | Full range | 3.7 | | | 3.7 | | | |
| | | $I_O$ = −2 mA | | 25°C | 3.5 | 3.9 | | 3.5 | 3.9 | | |
| | | | | Full range | 3.4 | | | 3.4 | | | |
| | | $I_O$ = −20 mA | | 25°C | 1.5 | 2.3 | | 1.5 | 2.3 | | |
| | | | | Full range | 1.5 | | | 1.5 | | | |
| $V_{OM-}$ | Maximum negative peak output voltage swing | $I_O$ = 200 µA | | 25°C | −3.5 | −4.2 | | −3.5 | −4.2 | | V |
| | | | | Full range | −3.4 | | | −3.4 | | | |
| | | $I_O$ = 2 mA | | 25°C | −3.7 | −4.1 | | −3.7 | −4.1 | | |
| | | | | Full range | −3.6 | | | −3.6 | | | |
| | | $I_O$ = 20 mA | | 25°C | −1.5 | −2.4 | | −1.5 | −2.4 | | |
| | | | | Full range | −1.5 | | | −1.5 | | | |
| $A_{VD}$ | Large-signal differential voltage amplification | $V_O$ = ± 2.3 V | $R_L$ = 600 Ω | 25°C | 80 | 91 | | 80 | 91 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| | | | $R_L$ = 2 kΩ | 25°C | 90 | 100 | | 90 | 100 | | |
| | | | | Full range | 89 | | | 89 | | | |
| | | | $R_L$ = 10 kΩ | 25°C | 95 | 106 | | 95 | 106 | | |
| | | | | Full range | 94 | | | 94 | | | |
| $r_i$ | Input resistance | $V_{IC}$ = 0 | | 25°C | | $10^{12}$ | | | $10^{12}$ | | Ω |
| $c_i$ | Input capacitance | $V_{IC}$ = 0, See Figure 5 | Common mode | 25°C | | 11 | | | 11 | | pF |
| | | | Differential | 25°C | | 2.5 | | | 2.5 | | |
| $z_o$ | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMRR | Common-mode rejection ratio | $V_{IC}$ = $V_{ICR}$min, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 70 | 89 | | 70 | 89 | | dB |
| | | | | Full range | 68 | | | 68 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm}$ = ±5 V to ±15 V, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 82 | 99 | | 82 | 99 | | dB |
| | | | | Full range | 80 | | | 80 | | | |

† Full range is 0°C to 70°C.

### TLE2081C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V (unless otherwise noted) (continued)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081C | | | TLE2081AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $I_{CC}$ | Supply current | $V_O$ = 0, No load | | 25°C | 1.35 | 1.6 | 2.2 | 1.35 | 1.6 | 2.2 | mA |
| | | | | Full range | | | 2.2 | | | 2.2 | |
| $I_{OS}$ | Short-circuit output current | $V_O$ = 0 | $V_{ID}$ = 1 V | 25°C | | –35 | | | –35 | | mA |
| | | | $V_{ID}$ = –1 V | | | 45 | | | 45 | | |

† Full range is 0°C to 70°C.

### TLE2081C operating characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081C | | | TLE2081AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR+ | Positive slew rate | $V_{O(PP)}$ = ±2.3 V, $A_{VD}$ = –1, $C_L$ = 100 pF, $R_L$ = 2 kΩ, See Figure 1 | | 25°C | | 35 | | | 35 | | V/µs |
| | | | | Full range | 23 | | | 23 | | | |
| SR– | Negative slew rate | | | 25°C | | 38 | | | 38 | | V/µs |
| | | | | Full range | 23 | | | 23 | | | |
| $t_s$ | Settling time | $A_{VD}$ = –1, 2-V step, $R_L$ = 1 kΩ, $C_L$ = 100 pF | To 10 mV | 25°C | | 0.25 | | | 0.25 | | µs |
| | | | To 1 mV | | | 0.4 | | | 0.4 | | |
| $V_n$ | Equivalent input noise voltage | $R_S$ = 20 Ω, See Figure 3 | f = 10 Hz | 25°C | | 28 | | | 28 | | nV/√Hz |
| | | | f = 10 kHz | | | 11.6 | | | 11.6 | | |
| $V_{N(PP)}$ | Peak-to-peak equivalent input noise voltage | | f = 10 Hz to 10 kHz | 25°C | | 6 | | | 6 | | µV |
| | | | f = 0.1 Hz to 10 Hz | | | 0.6 | | | 0.6 | | |
| $I_n$ | Equivalent input noise current | $V_{IC}$ = 0, | f = 10 kHz | 25°C | | 2.8 | | | 2.8 | | fA/√Hz |
| THD + N | Total harmonic distortion plus noise | $V_{O(PP)}$ = 5 V, $A_{VD}$ = 10, f = 1 kHz, $R_L$ = 2 kΩ, $R_S$ = 25 Ω | | 25°C | | 0.013% | | | 0.013% | | |
| $B_1$ | Unity-gain bandwidth | $V_I$ = 10 mV, $C_L$ = 25 pF, $R_L$ = 2 kΩ, See Figure 2 | | 25°C | | 9.4 | | | 9.4 | | MHz |
| $B_{OM}$ | Maximum output-swing bandwidth | $V_{O(PP)}$ = 4 V, $A_{VD}$ = –1, $R_L$ = 2 kΩ , $C_L$ = 25 pF | | 25°C | | 2.8 | | | 2.8 | | MHz |
| $\phi_m$ | Phase margin at unity gain | $V_I$ = 10 mV, $C_L$ = 25 pF, $R_L$ = 2 kΩ, See Figure 2 | | 25°C | | 56° | | | 56° | | |

† Full range is 0°C to 70°C.

## TLE2081C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081C | | | TLE2081AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{IC}$ = 0, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | | 0.49 | 6 | | 0.47 | 3 | mV |
| | | | | Full range | | | 8 | | | 5 | |
| $\alpha_{VIO}$ | Temperature coefficient of input offset voltage | | | Full range | | 3.2 | 29 | | 3.2 | 29 | μV/°C |
| $I_{IO}$ | Input offset current | $V_{IC}$ = 0, $V_O$ = 0, See Figure 4 | | 25°C | | 6 | 100 | | 6 | 100 | nA |
| | | | | Full range | | | 1.4 | | | 1.4 | |
| $I_{IB}$ | Input bias current | | | 25°C | | 20 | 175 | | 20 | 175 | nA |
| | | | | Full range | | | 5 | | | 5 | |
| $V_{ICR}$ | Common-mode input voltage range | $R_S$ = 50 Ω | | 25°C | 15 to −11 | 15 to −11.9 | | 15 to −11 | 15 to −11.9 | | V |
| | | | | Full range | 15 to −10.9 | | | 15 to −10.9 | | | |
| $V_{OM+}$ | Maximum positive peak output voltage swing | $I_O$ = −200 μA | | 25°C | 13.8 | 14.1 | | 13.8 | 14.1 | | V |
| | | | | Full range | 13.7 | | | 13.7 | | | |
| | | $I_O$ = −2 mA | | 25°C | 13.5 | 13.9 | | 13.5 | 13.9 | | |
| | | | | Full range | 13.4 | | | 13.4 | | | |
| | | $I_O$ = −20 mA | | 25°C | 11.5 | 12.3 | | 11.5 | 12.3 | | |
| | | | | Full range | 11.5 | | | 11.5 | | | |
| $V_{OM-}$ | Maximum negative peak output voltage swing | $I_O$ = 200 μA | | 25°C | −13.8 | −14.2 | | −13.8 | −14.2 | | V |
| | | | | Full range | −13.7 | | | −13.7 | | | |
| | | $I_O$ = 2 mA | | 25°C | −13.5 | −14 | | −13.5 | −14 | | |
| | | | | Full range | −13.4 | | | −13.4 | | | |
| | | $I_O$ = 20 mA | | 25°C | −11.5 | −12.4 | | −11.5 | −12.4 | | |
| | | | | Full range | −11.5 | | | −11.5 | | | |
| $A_{VD}$ | Large-signal differential voltage amplification | $V_O$ = ± 10 V | $R_L$ = 600 Ω | 25°C | 80 | 96 | | 80 | 96 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| | | | $R_L$ = 2 kΩ | 25°C | 90 | 109 | | 90 | 109 | | |
| | | | | Full range | 89 | | | 89 | | | |
| | | | $R_L$ = 10 kΩ | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | | Full range | 94 | | | 94 | | | |
| $r_i$ | Input resistance | $V_{IC}$ = 0 | | 25°C | | $10^{12}$ | | | $10^{12}$ | | Ω |
| $c_i$ | Input capacitance | $V_{IC}$ = 0, See Figure 5 | Common mode | 25°C | | 7.5 | | | 7.5 | | pF |
| | | | Differential | 25°C | | 2.5 | | | 2.5 | | |
| $z_o$ | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMRR | Common-mode rejection ratio | $V_{IC}$ = $V_{ICR}$min, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 80 | 98 | | 80 | 98 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm}$ = ±5 V to ±15 V, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 82 | 99 | | 82 | 99 | | dB |
| | | | | Full range | 80 | | | 81 | | | |

† Full range is 0°C to 70°C.

### TLE2081C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V (unless otherwise noted) (continued)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081C | | | TLE2081AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $I_{CC}$ | Supply current | $V_O$ = 0, No load | | 25°C | 1.35 | 1.7 | 2.2 | 1.35 | 1.7 | 2.2 | mA |
| | | | | Full range | | | 2.2 | | | 2.2 | |
| $I_{OS}$ | Short-circuit output current | $V_O$ = 0 | $V_{ID}$ = 1 V | 25°C | −30 | −45 | | −30 | −45 | | mA |
| | | | $V_{ID}$ = −1 V | | 30 | 48 | | 30 | 48 | | |

† Full range is 0°C to 70°C.

### TLE2081C operating characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081C | | | TLE2081AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR+ | Positive slew rate | $V_{O(PP)}$ = 10 V, $A_{VD}$ = −1, $R_L$ = 2 kΩ, $C_L$ = 100 pF, See Figure 1 | | 25°C | 30 | 40 | | 30 | 40 | | V/µs |
| | | | | Full range | 27 | | | 27 | | | |
| SR− | Negative slew rate | | | 25°C | 30 | 45 | | 30 | 45 | | V/µs |
| | | | | Full range | 27 | | | 27 | | | |
| $t_s$ | Settling time | $A_{VD}$ = −1, 10-V step, $R_L$ = 1 kΩ, $C_L$ = 100 pF | To 10 mV | 25°C | | 0.4 | | | 0.4 | | µs |
| | | | To 1 mV | | | 1.5 | | | 1.5 | | |
| $V_n$ | Equivalent input noise voltage | $R_S$ = 20 Ω, See Figure 3 | f = 10 Hz | 25°C | | 28 | | | 28 | | nV/√Hz |
| | | | f = 10 kHz | | | 11.6 | | | 11.6 | | |
| $V_{N(PP)}$ | Peak-to-peak equivalent input noise voltage | | f = 10 Hz to 10 kHz | 25°C | | 6 | | | 6 | | µV |
| | | | f = 0.1 Hz to 10 Hz | | | 0.6 | | | 0.6 | | |
| $I_n$ | Equivalent input noise current | $V_{IC}$ = 0, f = 10 kHz | | 25°C | | 2.8 | | | 2.8 | | fA/√Hz |
| THD + N | Total harmonic distortion plus noise | $V_{O(PP)}$ = 20 V, $A_{VD}$ = 10, f = 1 kHz, $R_L$ = 2 kΩ, $R_S$ = 25 Ω | | 25°C | | 0.008% | | | 0.008% | | |
| $B_1$ | Unity-gain bandwidth | $V_I$ = 10 mV, $R_L$ = 2 kΩ, $C_L$ = 25 pF, See Figure 2 | | 25°C | 8 | 10 | | 8 | 10 | | MHz |
| $B_{OM}$ | Maximum output-swing bandwidth | $V_{O(PP)}$ = 20 V, $A_{VD}$ = −1, $R_L$ = 2 kΩ, $C_L$ = 25 pF | | 25°C | 478 | 637 | | 478 | 637 | | kHz |
| $\phi_m$ | Phase margin at unity gain | $V_I$ = 10 mV, $R_L$ = 2 kΩ, $C_L$ = 25 pF, See Figure 2 | | 25°C | | 57° | | | 57° | | |

† Full range is 0°C to 70°C.

## TLE2081I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081I | | | TLE2081AI | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{IC}$ = 0, $V_O$ = 0, $R_S$ = 50 Ω, | | 25°C | | 0.34 | 6 | | 0.3 | 3 | mV |
| | | | | Full range | | | 7.6 | | | 5.6 | |
| $\alpha_{VIO}$ | Temperature coefficient of input offset voltage | | | Full range | | 3.2 | 29 | | 3.2 | 29 | µV/°C |
| $I_{IO}$ | Input offset current | $V_{IC}$ = 0, $V_O$ = 0, See Figure 4 | | 25°C | | 5 | 100 | | 5 | 100 | pA |
| | | | | Full range | | | 5 | | | 5 | nA |
| $I_{IB}$ | Input bias current | | | 25°C | | 15 | 175 | | 15 | 175 | pA |
| | | | | Full range | | | 10 | | | 10 | nA |
| $V_{ICR}$ | Common-mode input voltage range | $R_S$ = 50 Ω | | 25°C | 5 to −1 | 5 to −1.9 | | 5 to −1 | 5 to −1.9 | | V |
| | | | | Full range | 5 to −0.8 | | | 5 to −0.8 | | | |
| $V_{OM+}$ | Maximum positive peak output voltage swing | $I_O$ = −200 µA | | 25°C | 3.8 | 4.1 | | 3.8 | 4.1 | | V |
| | | | | Full range | 3.7 | | | 3.7 | | | |
| | | $I_O$ = −2 mA | | 25°C | 3.5 | 3.9 | | 3.5 | 3.9 | | |
| | | | | Full range | 3.4 | | | 3.4 | | | |
| | | $I_O$ = −20 mA | | 25°C | 1.5 | 2.3 | | 1.5 | 2.3 | | |
| | | | | Full range | 1.5 | | | 1.5 | | | |
| $V_{OM-}$ | Maximum negative peak output voltage swing | $I_O$ = 200 µA | | 25°C | −3.8 | −4.2 | | −3.8 | −4.2 | | V |
| | | | | Full range | −3.7 | | | −3.7 | | | |
| | | $I_O$ = 2 mA | | 25°C | −3.5 | −4.1 | | −3.5 | −4.1 | | |
| | | | | Full range | −3.4 | | | −3.4 | | | |
| | | $I_O$ = 20 mA | | 25°C | −1.5 | −2.4 | | −1.5 | −2.4 | | |
| | | | | Full range | −1.5 | | | −1.5 | | | |
| $A_{VD}$ | Large-signal differential voltage amplification | $V_O$ = ± 2.3 V | $R_L$ = 600 Ω | 25°C | 80 | 91 | | 80 | 91 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| | | | $R_L$ = 2 kΩ | 25°C | 90 | 100 | | 90 | 100 | | |
| | | | | Full range | 89 | | | 89 | | | |
| | | | $R_L$ = 10 kΩ | 25°C | 95 | 106 | | 95 | 106 | | |
| | | | | Full range | 94 | | | 94 | | | |
| $r_i$ | Input resistance | $V_{IC}$ = 0 | | 25°C | | $10^{12}$ | | | $10^{12}$ | | Ω |
| $c_i$ | Input capacitance | $V_{IC}$ = 0, See Figure 5 | Common mode | 25°C | | 11 | | | 11 | | pF |
| | | | Differential | 25°C | | 2.5 | | | 2.5 | | |
| $z_o$ | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMRR | Common-mode rejection ratio | $V_{IC}$ = $V_{ICR}$min, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 70 | 89 | | 70 | 89 | | dB |
| | | | | Full range | 68 | | | 68 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm}$ = ±5 V to ±15 V, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 82 | 99 | | 82 | 99 | | dB |
| | | | | Full range | 80 | | | 80 | | | |

† Full range is −40°C to 85°C.

## TLE2081I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V (unless otherwise noted) (continued)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081I | | | TLE2081AI | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $I_{CC}$ | Supply current | $V_O$ = 0, No load | | 25°C | 1.35 | 1.6 | 2.2 | 1.35 | 1.6 | 2.2 | mA |
| | | | | Full range | | | 2.2 | | | 2.2 | |
| $I_{OS}$ | Short-circuit output current | $V_O$ = 0 | $V_{ID}$ = 1 V | 25°C | | –35 | | | –35 | | mA |
| | | | $V_{ID}$ = –1 V | | | 45 | | | 45 | | |

† Full range is –40°C to 85°C.

## TLE2081I operating characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081I | | | TLE2081AI | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR+ | Positive slew rate | $V_{O(PP)}$ = ±2.3 V, $A_{VD}$ = –1, $C_L$ = 100 pF, $R_L$ = 2 kΩ, See Figure 1 | | 25°C | | 35 | | | 35 | | V/µs |
| | | | | Full range | 22 | | | 22 | | | |
| SR– | Negative slew rate | | | 25°C | | 38 | | | 38 | | V/µs |
| | | | | Full range | 22 | | | 22 | | | |
| $t_s$ | Settling time | $A_{VD}$ = –1, 2-V step, $R_L$ = 1 kΩ, $C_L$ = 100 pF | To 10 mV | 25°C | | 0.25 | | | 0.25 | | µs |
| | | | To 1 mV | | | 0.4 | | | 0.4 | | |
| $V_n$ | Equivalent input noise voltage | $R_S$ = 20 Ω, See Figure 3 | f = 10 Hz | 25°C | | 28 | | | 28 | | nV/√Hz |
| | | | f = 10 kHz | | | 11.6 | | | 11.6 | | |
| $V_{N(PP)}$ | Peak-to-peak equivalent input noise voltage | | f = 10 Hz to 10 kHz | 25°C | | 6 | | | 6 | | µV |
| | | | f = 0.1 Hz to 10 Hz | | | 0.6 | | | 0.6 | | |
| $I_n$ | Equivalent input noise current | $V_{IC}$ = 0, | f = 10 kHz | 25°C | | 2.8 | | | 2.8 | | fA/√Hz |
| THD + N | Total harmonic distortion plus noise | $V_{O(PP)}$ = 5 V, $A_{VD}$ = 10, f = 1 kHz, $R_L$ = 2 kΩ, $R_S$ = 25 Ω | | 25°C | | 0.013% | | | 0.013% | | |
| $B_1$ | Unity-gain bandwidth | $V_I$ = 10 mV, $C_L$ = 25 pF, $R_L$ = 2 kΩ, See Figure 2 | | 25°C | | 9.4 | | | 9.4 | | MHz |
| $B_{OM}$ | Maximum output-swing bandwidth | $V_{O(PP)}$ = 4 V, $A_{VD}$ = –1, $R_L$ = 2 kΩ , $C_L$ = 25 pF | | 25°C | | 2.8 | | | 2.8 | | MHz |
| $\phi_m$ | Phase margin at unity gain | $V_I$ = 10 mV, $C_L$ = 25 pF, $R_L$ = 2 kΩ, See Figure 2 | | 25°C | | 56° | | | 56° | | |

† Full range is –40°C to 85°C.

## TLE2081I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081I | | | TLE2081AI | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{IC}$ = 0, $V_O$ = 0, $R_S$ = 50 Ω, | | 25°C | | 0.49 | 6 | | 0.47 | 3 | mV |
| | | | | Full range | | | 7.6 | | | 5.6 | |
| $\alpha_{VIO}$ | Temperature coefficient of input offset voltage | | | Full range | | 3.2 | 29 | | 3.2 | 29 | µV/°C |
| $I_{IO}$ | Input offset current | $V_{IC}$ = 0, $V_O$ = 0, See Figure 4 | | 25°C | | 6 | 100 | | 6 | 100 | pA |
| | | | | Full range | | | 5 | | | 5 | nA |
| $I_{IB}$ | Input bias current | | | 25°C | | 20 | 175 | | 20 | 175 | pA |
| | | | | Full range | | | 10 | | | 10 | nA |
| $V_{ICR}$ | Common-mode input voltage range | $R_S$ = 50 Ω | | 25°C | 15 to −11 | 15 to −11.9 | | 15 to −11 | 15 to −11.9 | | V |
| | | | | Full range | 15 to −10.8 | | | 15 to −10.8 | | | |
| $V_{OM+}$ | Maximum positive peak output voltage swing | $I_O$ = −200 µA | | 25°C | 13.8 | 14.1 | | 13.8 | 14.1 | | V |
| | | | | Full range | 13.7 | | | 13.7 | | | |
| | | $I_O$ = −2 mA | | 25°C | 13.5 | 13.9 | | 13.5 | 13.9 | | |
| | | | | Full range | 13.4 | | | 13.4 | | | |
| | | $I_O$ = −20 mA | | 25°C | 11.5 | 12.3 | | 11.5 | 12.3 | | |
| | | | | Full range | 11.5 | | | 11.5 | | | |
| $V_{OM-}$ | Maximum negative peak output voltage swing | $I_O$ = 200 µA | | 25°C | −13.8 | −14.2 | | −13.8 | −14.2 | | V |
| | | | | Full range | −13.7 | | | −13.7 | | | |
| | | $I_O$ = 2 mA | | 25°C | −13.5 | −14 | | −13.5 | −14 | | |
| | | | | Full range | −13.4 | | | −13.4 | | | |
| | | $I_O$ = 20 mA | | 25°C | −11.5 | −12.4 | | −11.5 | −12.4 | | |
| | | | | Full range | −11.5 | | | −11.5 | | | |
| $A_{VD}$ | Large-signal differential voltage amplification | $V_O$ = ± 10 V | $R_L$ = 600 Ω | 25°C | 80 | 96 | | 80 | 96 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| | | | $R_L$ = 2 kΩ | 25°C | 90 | 109 | | 90 | 109 | | |
| | | | | Full range | 89 | | | 89 | | | |
| | | | $R_L$ = 10 kΩ | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | | Full range | 94 | | | 94 | | | |
| $r_i$ | Input resistance | $V_{IC}$ = 0 | | 25°C | | $10^{12}$ | | | $10^{12}$ | | Ω |
| $c_i$ | Input capacitance | $V_{IC}$ = 0, See Figure 5 | Common mode | 25°C | | 7.5 | | | 7.5 | | pF |
| | | | Differential | 25°C | | 2.5 | | | 2.5 | | |
| $z_o$ | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMRR | Common-mode rejection ratio | $V_{IC}$ = $V_{ICR}$min, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 80 | 98 | | 80 | 98 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm}$ = ±5 V to ±15 V, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 82 | 99 | | 82 | 99 | | dB |
| | | | | Full range | 80 | | | 80 | | | |

† Full range is −40°C to 85°C.

### TLE2081I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V (unless otherwise noted) (continued)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081I | | | TLE2081AI | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $I_{CC}$ | Supply current | $V_O$ = 0, No load | | 25°C | 1.35 | 1.7 | 2.2 | 1.35 | 1.7 | 2.2 | mA |
| | | | | Full range | | | 2.2 | | | 2.2 | |
| $I_{OS}$ | Short-circuit output current | $V_O$ = 0 | $V_{ID}$ = 1 V | 25°C | –30 | –45 | | –30 | –45 | | mA |
| | | | $V_{ID}$ = –1 V | | 30 | 48 | | 30 | 48 | | |

† Full range is –40°C to 85°C.

### TLE2081I operating characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081I | | | TLE2081AI | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR+ | Positive slew rate | $V_{O(PP)}$ = ±10 V, $A_{VD}$ = –1, $C_L$ = 100 pF, | $R_L$ = 2 kΩ, See Figure 1 | 25°C | 30 | 40 | | 30 | 40 | | V/µs |
| | | | | Full range | 24 | | | 24 | | | |
| SR– | Negative slew rate | | | 25°C | 30 | 45 | | 30 | 45 | | V/µs |
| | | | | Full range | 24 | | | 24 | | | |
| $t_s$ | Settling time | $A_{VD}$ = –1, 10-V step, $R_L$ = 1 kΩ, $C_L$ = 100 pF | To 10 mV | 25°C | | 0.4 | | | 0.4 | | µs |
| | | | To 1 mV | | | 1.5 | | | 1.5 | | |
| $V_n$ | Equivalent input noise voltage | $R_S$ = 20 Ω, See Figure 3 | f = 10 Hz | 25°C | | 28 | | | 28 | | nV/√Hz |
| | | | f = 10 kHz | | | 11.6 | | | 11.6 | | |
| $V_{N(PP)}$ | Peak-to-peak equivalent input noise voltage | | f = 10 Hz to 10 kHz | 25°C | | 6 | | | 6 | | µV |
| | | | f = 0.1 Hz to 10 Hz | | | 0.6 | | | 0.6 | | |
| $I_n$ | Equivalent input noise current | $V_{IC}$ = 0, | f = 10 kHz | 25°C | | 2.8 | | | 2.8 | | fA/√Hz |
| THD + N | Total harmonic distortion plus noise | $V_{O(PP)}$ = 20 V, f = 1 kHz, $R_S$ = 25 Ω | $A_{VD}$ = 10, $R_L$ = 2 kΩ, | 25°C | | 0.008% | | | 0.008% | | |
| $B_1$ | Unity-gain bandwidth | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | 8 | 10 | | 8 | 10 | | MHz |
| $B_{OM}$ | Maximum output-swing bandwidth | $V_{O(PP)}$ = 20 V, $R_L$ = 2 kΩ, | $A_{VD}$ = –1, $C_L$ = 25 pF | 25°C | 478 | 637 | | 478 | 637 | | kHz |
| $\phi_m$ | Phase margin at unity gain | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | | 57° | | | 57° | | |

† Full range is –40°C to 85°C.

**TLE2081M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V (unless otherwise noted)**

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081M | | | TLE2081AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{IC}$ = 0, $V_O$ = 0, $R_S$ = 50Ω | | 25°C | | 0.34 | 6 | | 0.3 | 3 | mV |
| | | | | Full range | | | 11.2 | | | 8.2 | |
| $\alpha_{VIO}$ | Temperature coefficient of input offset voltage | | | Full range | | 3.2 | 29* | | 3.2 | 29* | µV/°C |
| $I_{IO}$ | Input offset current | $V_{IC}$ = 0, $V_O$ = 0, See Figure 4 | | 25°C | | 5 | 100 | | 5 | 100 | pA |
| | | | | Full range | | | 20 | | | 20 | nA |
| $I_{IB}$ | Input bias current | | | 25°C | | 15 | 175 | | 15 | 175 | pA |
| | | | | Full range | | | 65 | | | 65 | nA |
| $V_{ICR}$ | Common-mode input voltage range | $R_S$ = 50 Ω | | 25°C | 5 to −1 | 5 to −1.9 | | 5 to −1 | 5 to −1.9 | | V |
| | | | | Full range | 5 to −0.8 | | | 5 to −0.8 | | | |
| $V_{OM+}$ | Maximum positive peak output voltage swing | $I_O$ = −200 µA | | 25°C | 3.8 | 4.1 | | 3.8 | 4.1 | | V |
| | | | | Full range | 3.6 | | | 3.6 | | | |
| | | $I_O$ = −2 mA | | 25°C | 3.5 | 3.9 | | 3.5 | 3.9 | | |
| | | | | Full range | 3.3 | | | 3.3 | | | |
| | | $I_O$ = −20 mA | | 25°C | 1.5 | 2.3 | | 1.5 | 2.3 | | |
| | | | | Full range | 1.4 | | | 1.4 | | | |
| $V_{OM-}$ | Maximum negative peak output voltage swing | $I_O$ = 200 µA | | 25°C | −3.8 | −4.2 | | −3.8 | −4.2 | | V |
| | | | | Full range | −3.6 | | | −3.6 | | | |
| | | $I_O$ = 2 mA | | 25°C | −3.5 | −4.1 | | −3.5 | −4.1 | | |
| | | | | Full range | −3.3 | | | −3.3 | | | |
| | | $I_O$ = 20 mA | | 25°C | −1.5 | −2.4 | | −1.5 | −2.4 | | |
| | | | | Full range | −1.4 | | | −1.4 | | | |
| $A_{VD}$ | Large-signal differential voltage amplification | $V_O$ = ± 2.3 V | $R_L$ = 600 Ω | 25°C | 80 | 91 | | 80 | 91 | | dB |
| | | | | Full range | 78 | | | 78 | | | |
| | | | $R_L$ = 2 kΩ | 25°C | 90 | 100 | | 90 | 100 | | |
| | | | | Full range | 88 | | | 88 | | | |
| | | | $R_L$ = 10 kΩ | 25°C | 95 | 106 | | 95 | 106 | | |
| | | | | Full range | 93 | | | 93 | | | |
| $r_i$ | Input resistance | $V_{IC}$ = 0 | | 25°C | | $10^{12}$ | | | $10^{12}$ | | Ω |
| $c_i$ | Input capacitance | $V_{IC}$ = 0, See Figure 5 | Common mode | 25°C | | 11 | | | 11 | | pF |
| | | | Differential | 25°C | | 2.5 | | | 2.5 | | |
| $z_o$ | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMRR | Common-mode rejection ratio | $V_{IC}$ = $V_{ICR}$min, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 70 | 89 | | 70 | 89 | | dB |
| | | | | Full range | 68 | | | 68 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm}$ = ±5 V to ±15 V, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 82 | 99 | | 82 | 99 | | dB |
| | | | | Full range | 80 | | | 80 | | | |

*On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested.
† Full range is −55°C to 125°C.

### TLE2081M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V (unless otherwise noted) (continued)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081M | | | TLE2081AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $I_{CC}$ | Supply current | $V_O$ = 0, | No load | 25°C | 1.35 | 1.6 | 2.2 | 1.35 | 1.6 | 2.2 | mA |
| | | | | Full range | | | 2.2 | | | 2.2 | |
| $I_{OS}$ | Short-circuit output current | $V_O$ = 0 | $V_{ID}$ = 1 V | 25°C | | –35 | | | –35 | | mA |
| | | | $V_{ID}$ = –1 V | | | 45 | | | 45 | | |

† Full range is –55°C to 125°C.

### TLE2081M operating characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081M | | | TLE2081AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR+ | Positive slew rate | $V_{O(PP)}$ = ±2.3 V, $A_{VD}$ = –1, $C_L$ = 100 pF, | $R_L$ = 2 kΩ, See Figure 1 | 25°C | | 35 | | | 35 | | V/µs |
| | | | | Full range | 20* | | | 20* | | | |
| SR– | Negative slew rate | | | 25°C | | 38 | | | 38 | | V/µs |
| | | | | Full range | 20* | | | 20* | | | |
| $t_s$ | Settling time | $A_{VD}$ = –1, 2-V step, $R_L$ = 1 kΩ, $C_L$ = 100 pF | To 10 mV | 25°C | | 0.25 | | | 0.25 | | µs |
| | | | To 1 mV | | | 0.4 | | | 0.4 | | |
| $V_n$ | Equivalent input noise voltage | $R_S$ = 20 Ω, See Figure 3 | f = 10 Hz | 25°C | | 28 | | | 28 | | nV/√Hz |
| | | | f = 10 kHz | | | 11.6 | | | 11.6 | | |
| $V_{N(PP)}$ | Peak-to-peak equivalent input noise voltage | | f = 10 Hz to 10 kHz | 25°C | | 6 | | | 6 | | µV |
| | | | f = 0.1 Hz to 10 Hz | | | 0.6 | | | 0.6 | | |
| $I_n$ | Equivalent input noise current | $V_{IC}$ = 0, | f = 10 kHz | 25°C | | 2.8 | | | 2.8 | | fA/√Hz |
| THD + N | Total harmonic distortion plus noise | $V_{O(PP)}$ = 5 V, f = 1 kHz, $R_S$ = 25 Ω | $A_{VD}$ = 10, $R_L$ = 2 kΩ, | 25°C | | 0.013% | | | 0.013% | | |
| $B_1$ | Unity-gain bandwidth | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | | 9.4 | | | 9.4 | | MHz |
| $B_{OM}$ | Maximum output-swing bandwidth | $V_{O(PP)}$ = 4 V, $R_L$ = 2 kΩ , | $A_{VD}$ = –1, $C_L$ = 25 pF | 25°C | | 2.8 | | | 2.8 | | MHz |
| $\phi_m$ | Phase margin at unity gain | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | | 56° | | | 56° | | |

*On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested.
† Full range is –55°C to 125°C.

## TLE2081M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081M | | | TLE2081AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{IC}$ = 0, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | | 0.49 | 6 | | 0.47 | 3 | mV |
| | | | | Full range | | | 11.2 | | | 8.2 | |
| $\alpha_{VIO}$ | Temperature coefficient of input offset voltage | | | Full range | | 3.2 | 29* | | 3.2 | 29* | µV/°C |
| $I_{IO}$ | Input offset current | $V_{IC}$ = 0, $V_O$ = 0, See Figure 4 | | 25°C | | 6 | 100 | | 6 | 100 | pA |
| | | | | Full range | | | 20 | | | 20 | nA |
| $I_{IB}$ | Input bias current | | | 25°C | | 20 | 175 | | 20 | 175 | pA |
| | | | | Full range | | | 65 | | | 65 | nA |
| $V_{ICR}$ | Common-mode input voltage range | $R_S$ = 50 Ω | | 25°C | 15 to −11 | 15 to −11.9 | | 15 to −11 | 15 to −11.9 | | V |
| | | | | Full range | 15 to −10.8 | | | 15 to −10.8 | | | |
| $V_{OM+}$ | Maximum positive peak output voltage swing | $I_O$ = −200 µA | | 25°C | 13.8 | 14.1 | | 13.8 | 14.1 | | V |
| | | | | Full range | 13.6 | | | 13.6 | | | |
| | | $I_O$ = −2 mA | | 25°C | 13.5 | 13.9 | | 13.5 | 13.9 | | |
| | | | | Full range | 13.3 | | | 13.3 | | | |
| | | $I_O$ = −20 mA | | 25°C | 11.5 | 12.3 | | 11.5 | 12.3 | | |
| | | | | Full range | 11.4 | | | 11.4 | | | |
| $V_{OM-}$ | Maximum negative peak output voltage swing | $I_O$ = 200 µA | | 25°C | −13.8 | −14.2 | | −13.8 | −14.2 | | V |
| | | | | Full range | −13.6 | | | −13.6 | | | |
| | | $I_O$ = 2 mA | | 25°C | −13.5 | −14 | | −13.5 | −14 | | |
| | | | | Full range | −13.3 | | | −13.3 | | | |
| | | $I_O$ = 20 mA | | 25°C | −11.5 | −12.4 | | −11.5 | −12.4 | | |
| | | | | Full range | −11.4 | | | −11.4 | | | |
| $A_{VD}$ | Large-signal differential voltage amplification | $V_O$ = ± 10 V | $R_L$ = 600 Ω | 25°C | 80 | 96 | | 80 | 96 | | dB |
| | | | | Full range | 78 | | | 78 | | | |
| | | | $R_L$ = 2 kΩ | 25°C | 90 | 109 | | 90 | 109 | | |
| | | | | Full range | 88 | | | 88 | | | |
| | | | $R_L$ = 10 kΩ | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | | Full range | 93 | | | 93 | | | |
| $r_i$ | Input resistance | $V_{IC}$ = 0 | | 25°C | | $10^{12}$ | | | $10^{12}$ | | Ω |
| $c_i$ | Input capacitance | $V_{IC}$ = 0, See Figure 5 | Common mode | 25°C | | 7.5 | | | 7.5 | | pF |
| | | | Differential | 25°C | | 2.5 | | | 2.5 | | |
| $z_o$ | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMRR | Common-mode rejection ratio | $V_{IC}$ = $V_{ICR}$min, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 80 | 98 | | 80 | 98 | | dB |
| | | | | Full range | 78 | | | 78 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm}$ = ±5 V to ±15 V, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 82 | 99 | | 82 | 99 | | dB |
| | | | | Full range | 80 | | | 80 | | | |

*On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested.
† Full range is −55°C to 125°C.

### TLE2081M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V (unless otherwise noted)(continued)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081M | | | TLE2081AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $I_{CC}$ | Supply current | $V_O$ = 0, | No load | 25°C | 1.35 | 1.7 | 2.2 | 1.35 | 1.7 | 2.2 | mA |
| | | | | Full range | | | 2.2 | | | 2.2 | |
| $I_{OS}$ | Short-circuit output current | $V_O$ = 0 | $V_{ID}$ = 1 V | 25°C | –30 | –45 | | –30 | –45 | | mA |
| | | | $V_{ID}$ = –1 V | | 30 | 48 | | 30 | 48 | | |

† Full range is –55°C to 125°C.

### TLE2081M operating characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081M | | | TLE2081AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR+ | Positive slew rate | $V_{O(PP)}$ = 10 V, $A_{VD}$ = –1, $C_L$ = 100 pF, | $R_L$ = 2 kΩ, See Figure 1 | 25°C | 30 | 40 | | 30 | 40 | | V/µs |
| | | | | Full range | 22 | | | 22 | | | |
| SR– | Negative slew rate | | | 25°C | 30 | 45 | | 30 | 45 | | V/µs |
| | | | | Full range | 22 | | | 22 | | | |
| $t_s$ | Settling time | $A_{VD}$ = –1, 10-V step, $R_L$ = 1 kΩ, $C_L$ = 100 pF | To 10 mV | 25°C | | 0.4 | | | 0.4 | | µs |
| | | | To 1 mV | | | 1.5 | | | 1.5 | | |
| $V_n$ | Equivalent input noise voltage | $R_S$ = 20 Ω, See Figure 3 | f = 10 Hz | 25°C | | 28 | | | 28 | | nV/√Hz |
| | | | f = 10 kHz | | | 11.6 | | | 11.6 | | |
| $V_{N(PP)}$ | Peak-to-peak equivalent input noise voltage | | f = 10 Hz to 10 kHz | 25°C | | 6 | | | 6 | | µV |
| | | | f = 0.1 Hz to 10 Hz | | | 0.6 | | | 0.6 | | |
| $I_n$ | Equivalent input noise current | $V_{IC}$ = 0, | f = 10 kHz | 25°C | | 2.8 | | | 2.8 | | fA/√Hz |
| THD + N | Total harmonic distortion plus noise | $V_{O(PP)}$ = 20 V, f = 1 kHz, $R_S$ = 25 Ω | $A_{VD}$ = 10, $R_L$ = 2 kΩ, | 25°C | | 0.008% | | | 0.008% | | |
| $B_1$ | Unity-gain bandwidth | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | 8* | 10 | | 8* | 10 | | MHz |
| $B_{OM}$ | Maximum output-swing bandwidth | $V_{O(PP)}$ = 20 V, $R_L$ = 2 kΩ, | $A_{VD}$ = –1, $C_L$ = 25 pF | 25°C | 478* | 637 | | 478* | 637 | | kHz |
| $\phi_m$ | Phase margin at unity gain | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | | 57° | | | 57° | | |

*On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested.
† Full range is –55°C to 125°C.

## TLE2081Y electrical characteristics at $V_{CC\pm}$ = ±15 V, $T_A$ = 25°C

| PARAMETER | | TEST CONDITIONS | | | TLE2081Y MIN | TLE2081Y TYP | TLE2081Y MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_{IO}$ | Input offset voltage | $V_{IC}$ = 0, | $V_O$ = 0, | $R_S$ = 50 Ω | | 0.49 | 6 | mV |
| $I_{IO}$ | Input offset current | $V_{IC}$ = 0, | $V_O$ = 0, | See Figure 4 | | 6 | 100 | pA |
| $I_{IB}$ | Input bias current | | | | | 20 | 175 | |
| $V_{ICR}$ | Common-mode input voltage range | $R_S$ = 50 Ω | | | 15 to −11 | 15 to 11.9 | | V |
| $V_{OM+}$ | Maximum positive peak output voltage swing | $I_O$ = −200 µA | | | 13.8 | 14.1 | | V |
| | | $I_O$ = −2 mA | | | 13.5 | 13.9 | | |
| | | $I_O$ = −20 mA | | | 11.5 | 12.3 | | |
| $V_{OM-}$ | Maximum negative peak output voltage swing | $I_O$ = 200 µA | | | −13.8 | −14.2 | | V |
| | | $I_O$ = 2 mA | | | −13.5 | −14 | | |
| | | $I_O$ = 20 mA | | | −11.5 | −12.4 | | |
| $A_{VD}$ | Large-signal differential voltage amplification | $V_O$ = ± 10 V | $R_L$ = 600 Ω | | 80 | 96 | | dB |
| | | | $R_L$ = 2 kΩ | | 90 | 109 | | |
| | | | $R_L$ = 10 kΩ | | 95 | 118 | | |
| $r_i$ | Input resistance | $V_{IC}$ = 0 | | | | $10^{12}$ | | Ω |
| $c_i$ | Input capacitance | $V_{IC}$ = 0, See Figure 5 | Common mode | | | 7.5 | | pF |
| | | | Differential | | | 2.5 | | |
| $z_o$ | Open-loop output impedance | f = 1 MHz | | | | 80 | | Ω |
| CMRR | Common-mode rejection ratio | $V_{IC}$ = $V_{ICR}$min, | $V_O$ = 0, | $R_S$ = 50 Ω | 80 | 98 | | dB |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm}$ = ±5 V to ±15 V, | $V_O$ = 0, | $R_S$ = 50 Ω | 82 | 99 | | dB |
| $I_{CC}$ | Supply current | $V_O$ = 0, | No load | | 1.35 | 1.7 | 2.2 | mA |
| $I_{OS}$ | Short-circuit output current | $V_O$ = 0 | $V_{ID}$ = 1 V | | −30 | −45 | | mA |
| | | | $V_{ID}$ = −1 V | | 30 | 48 | | |

## TLE2082C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2082C | | | TLE2082AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{IC}$ = 0, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | | 0.9 | 6 | | 0.65 | 4 | mV |
| | | | | Full range | | | 8.1 | | | 5.1 | |
| $\alpha_{VIO}$ | Temperature coefficient of input offset voltage | | | Full range | | 2.3 | 25 | | 2.3 | 25 | µV/°C |
| $I_{IO}$ | Input offset current | $V_{IC}$ = 0, $V_O$ = 0, See Figure 4 | | 25°C | | 5 | 100 | | 5 | 100 | pA |
| | | | | Full range | | | 1.4 | | | 1.4 | nA |
| $I_{IB}$ | Input bias current | | | 25°C | | 15 | 175 | | 15 | 175 | pA |
| | | | | Full range | | | 5 | | | 5 | nA |
| $V_{ICR}$ | Common-mode input voltage range | $R_S$ = 50 Ω | | 25°C | 5 to −1 | 5 to −1.9 | | 5 to −1 | 5 to −1.9 | | V |
| | | | | Full range | 5 to −0.9 | | | 5 to −0.9 | | | |
| $V_{OM+}$ | Maximum positive peak output voltage swing | $I_O$ = −200 µA | | 25°C | 3.8 | 4.1 | | 3.8 | 4.1 | | V |
| | | | | Full range | 3.7 | | | 3.7 | | | |
| | | $I_O$ = −2 mA | | 25°C | 3.5 | 3.9 | | 3.5 | 3.9 | | |
| | | | | Full range | 3.4 | | | 3.4 | | | |
| | | $I_O$ = −20 mA | | 25°C | 1.5 | 2.3 | | 1.5 | 2.3 | | |
| | | | | Full range | 1.5 | | | 1.5 | | | |
| $V_{OM-}$ | Maximum negative peak output voltage swing | $I_O$ = 200 µA | | 25°C | −3.8 | −4.2 | | −3.8 | −4.2 | | V |
| | | | | Full range | −3.7 | | | −3.7 | | | |
| | | $I_O$ = 2 mA | | 25°C | −3.5 | −4.1 | | −3.5 | −4.1 | | |
| | | | | Full range | −3.4 | | | −3.4 | | | |
| | | $I_O$ = 20 mA | | 25°C | −1.5 | −2.4 | | −1.5 | −2.4 | | |
| | | | | Full range | −1.5 | | | −1.5 | | | |
| $A_{VD}$ | Large-signal differential voltage amplification | $V_O$ = ± 2.3 V | $R_L$ = 600 Ω | 25°C | 80 | 91 | | 80 | 91 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| | | | $R_L$ = 2 kΩ | 25°C | 90 | 100 | | 90 | 100 | | |
| | | | | Full range | 89 | | | 89 | | | |
| | | | $R_L$ = 10 kΩ | 25°C | 95 | 106 | | 95 | 106 | | |
| | | | | Full range | 94 | | | 94 | | | |
| $r_i$ | Input resistance | $V_{IC}$ = 0 | | 25°C | | $10^{12}$ | | | $10^{12}$ | | Ω |
| $c_i$ | Input capacitance, Common mode | $V_{IC}$ = 0, See Figure 5 | | 25°C | | 11 | | | 11 | | pF |
| | Input capacitance, Differential | | | 25°C | | 2.5 | | | 2.5 | | |
| $z_o$ | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMRR | Common-mode rejection ratio | $V_{IC}$ = $V_{ICR}$min, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 70 | 89 | | 70 | 89 | | dB |
| | | | | Full range | 68 | | | 68 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio($\Delta V_{CC\pm}$ /$\Delta V_{IO}$) | $V_{CC\pm}$ = ±5 V to ±15 V, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 82 | 99 | | 82 | 99 | | dB |
| | | | | Full range | 80 | | | 80 | | | |
| $I_{CC}$ | Supply current (both channels) | $V_O$ = 0, No load | | 25°C | 2.7 | 2.9 | 3.9 | 2.7 | 2.9 | 3.9 | mA |
| | | | | Full range | | | 3.9 | | | 3.9 | |

† Full range is 0°C to 70°C.

### TLE2082C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V (unless otherwise noted) (continued)

| PARAMETER | | TEST CONDITIONS | | $T_A$ | TLE2082C | | | TLE2082AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| | Crosstalk attenuation | $V_{IC}$ = 0, | $R_L$ = 2 kΩ | 25°C | | 120 | | | 120 | | dB |
| $I_{OS}$ | Short-circuit output current | $V_O$ = 0 | $V_{ID}$ = 1 V | 25°C | | –35 | | | –35 | | mA |
| | | | $V_{ID}$ = –1 V | | | 45 | | | 45 | | |

### TLE2082C operating characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2082C | | | TLE2082AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR+ | Positive slew rate | $V_{O(PP)}$ = ±2.3 V, $A_{VD}$ = –1, $C_L$ = 100 pF, | $R_L$ = 2 kΩ, See Figure 1 | 25°C | | 35 | | | 35 | | V/μs |
| | | | | Full range | 22 | | | 22 | | | |
| SR– | Negative slew rate | | | 25°C | | 38 | | | 38 | | V/μs |
| | | | | Full range | 22 | | | 22 | | | |
| $t_s$ | Settling time | $A_{VD}$ = –1, 2-V step, $R_L$ = 1 kΩ, $C_L$ = 100 pF | To 10 mV | 25°C | | 0.25 | | | 0.25 | | μs |
| | | | To 1 mV | | | 0.4 | | | 0.4 | | |
| $V_n$ | Equivalent input noise voltage | $R_S$ = 20 Ω, See Figure 3 | f = 10 Hz | 25°C | | 28 | | | 28 | | nV/√Hz |
| | | | f = 10 kHz | | | 11.6 | | | 11.6 | | |
| $V_{N(PP)}$ | Peak-to-peak equivalent input noise voltage | | f = 10 Hz to 10 kHz | 25°C | | 6 | | | 6 | | μV |
| | | | f = 0.1Hz to 10 Hz | | | 0.6 | | | 0.6 | | |
| $I_n$ | Equivalent input noise current | $V_{IC}$ = 0, | f = 10 kHz | 25°C | | 2.8 | | | 2.8 | | fA/√Hz |
| THD + N | Total harmonic distortion plus noise | $V_{O(PP)}$ = 5 V, f = 1 kHz, $R_S$ = 25 Ω | $A_{VD}$ = 10, $R_L$ = 2 kΩ, | 25°C | | 0.013% | | | 0.013% | | |
| $B_1$ | Unity-gain bandwidth | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | | 9.4 | | | 9.4 | | MHz |
| $B_{OM}$ | Maximum output-swing bandwidth | $V_{O(PP)}$ = 4 V, $R_L$ = 2 kΩ , | $A_{VD}$ = –1, $C_L$ = 25 pF | 25°C | | 2.8 | | | 2.8 | | MHz |
| $\phi_m$ | Phase margin at unity gain | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | | 56° | | | 56° | | |

† Full range is 0°C to 70°C.

## TLE2082C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V (unless otherwise noted)

| PARAMETER | | | TEST CONDITIONS | | $T_A$† | TLE2082C | | | TLE2082AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | | $V_{IC}$ = 0, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | | 1.1 | 7 | | 0.7 | 4 | mV |
| | | | | | Full range | | | 8.1 | | | 5.1 | |
| $\alpha_{VIO}$ | Temperature coefficient of input offset voltage | | | | Full range | | 2.4 | 25 | | 2.4 | 25 | µV/°C |
| $I_{IO}$ | Input offset current | | $V_{IC}$ = 0, $V_O$ = 0, See Figure 4 | | 25°C | | 6 | 100 | | 6 | 100 | pA |
| | | | | | Full range | | | 1.4 | | | 1.4 | nA |
| $I_{IB}$ | Input bias current | | | | 25°C | | 20 | 175 | | 20 | 175 | pA |
| | | | | | Full range | | | 5 | | | 5 | nA |
| $V_{ICR}$ | Common-mode input voltage range | | $R_S$ = 50 Ω | | 25°C | 15 to −11 | 15 to −11.9 | | 15 to −11 | 15 to −11.9 | | V |
| | | | | | Full range | 15 to −10.9 | | | 15 to −10.9 | | | |
| $V_{OM+}$ | Maximum positive peak output voltage swing | | $I_O$ = −200 µA | | 25°C | 13.8 | 14.1 | | 13.8 | 14.1 | | V |
| | | | | | Full range | 13.6 | | | 13.6 | | | |
| | | | $I_O$ = −2 mA | | 25°C | 13.5 | 13.9 | | 13.5 | 13.9 | | |
| | | | | | Full range | 13.4 | | | 13.4 | | | |
| | | | $I_O$ = −20 mA | | 25°C | 11.5 | 12.3 | | 11.5 | 12.3 | | |
| | | | | | Full range | 11.5 | | | 11.5 | | | |
| $V_{OM-}$ | Maximum negative peak output voltage swing | | $I_O$ = 200 µA | | 25°C | −13.8 | −14.2 | | −13.8 | −14.2 | | V |
| | | | | | Full range | −13.7 | | | −13.7 | | | |
| | | | $I_O$ = 2 mA | | 25°C | −13.5 | −14 | | −13.5 | −14 | | |
| | | | | | Full range | −13.4 | | | −13.4 | | | |
| | | | $I_O$ = 20 mA | | 25°C | −11.5 | −12.4 | | −11.5 | −12.4 | | |
| | | | | | Full range | −11.5 | | | −11.5 | | | |
| $A_{VD}$ | Large-signal differential voltage amplification | | $V_O$ = ± 10 V | $R_L$ = 600 Ω | 25°C | 80 | 96 | | 80 | 96 | | dB |
| | | | | | Full range | 79 | | | 79 | | | |
| | | | | $R_L$ = 2 kΩ | 25°C | 90 | 109 | | 90 | 109 | | |
| | | | | | Full range | 89 | | | 89 | | | |
| | | | | $R_L$ = 10 kΩ | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | | | Full range | 94 | | | 94 | | | |
| $r_i$ | Input resistance | | $V_{IC}$ = 0 | | 25°C | | $10^{12}$ | | | $10^{12}$ | | Ω |
| $c_i$ | Input capacitance | Common mode | $V_{IC}$ = 0, See Figure 5 | | 25°C | | 7.5 | | | 7.5 | | pF |
| | | Differential | | | 25°C | | 2.5 | | | 2.5 | | |
| $z_o$ | Open-loop output impedance | | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMRR | Common-mode rejection ratio | | $V_{IC}$ = $V_{ICR}$min, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 80 | 98 | | 80 | 98 | | dB |
| | | | | | Full range | 79 | | | 79 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | | $V_{CC\pm}$ = ±5 V to ±15 V, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 82 | 99 | | 82 | 99 | | dB |
| | | | | | Full range | 81 | | | 81 | | | |

† Full range is 0°C to 70°C.

### TLE2082C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V (unless otherwise noted) (continued)

| PARAMETER | | TEST CONDITIONS | | $T_A$ | TLE2082C | | | TLE2082AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $I_{CC}$ | Supply current (both channels) | $V_O$ = 0, | No load | 25°C | 2.7 | 3.1 | 3.9 | 2.7 | 3.1 | 3.9 | mA |
| | | | | Full range | | | 3.9 | | | 3.9 | |
| | Crosstalk attenuation | $V_{IC}$ = 0, | $R_L$ = 2 kΩ | 25°C | | 120 | | | 120 | | dB |
| $I_{OS}$ | Short-circuit output current | $V_O$ = 0 | $V_{ID}$ = 1 V | 25°C | −30 | −45 | | −30 | −45 | | mA |
| | | | $V_{ID}$ = −1 V | | 30 | 48 | | 30 | 48 | | |

### TLE2082C operating characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2082C | | | TLE2082AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR+ | Positive slew rate | $V_{O(PP)}$ = 10 V, $R_L$ = 2 kΩ, See Figure 1 | $A_{VD}$ = −1, $C_L$ = 100 pF, | 25°C | 28 | 40 | | 28 | 40 | | V/µs |
| | | | | Full range | 25 | | | 25 | | | |
| SR− | Negative slew rate | | | 25°C | 30 | 45 | | 30 | 45 | | V/µs |
| | | | | Full range | 25 | | | 25 | | | |
| $t_s$ | Settling time | $A_{VD}$ = −1, 10-V step, $R_L$ = 1 kΩ, $C_L$ = 100 pF | To 10 mV | 25°C | | 0.4 | | | 0.4 | | µs |
| | | | To 1 mV | | | 1.5 | | | 1.5 | | |
| $V_n$ | Equivalent input noise voltage | $R_S$ = 20 Ω, See Figure 3 | f = 10 Hz | 25°C | | 28 | | | 28 | | nV/√Hz |
| | | | f = 10 kHz | | | 11.6 | | | 11.6 | | |
| $V_{N(PP)}$ | Peak-to-peak equivalent input noise voltage | | f = 10 Hz to 10 kHz | 25°C | | 6 | | | 6 | | µV |
| | | | f = 0.1 Hz to 10 Hz | | | 0.6 | | | 0.6 | | |
| $I_n$ | Equivalent input noise current | $V_{IC}$ = 0, | f = 10 kHz | 25°C | | 2.8 | | | 2.8 | | fA/√Hz |
| THD + N | Total harmonic distortion plus noise | $V_{O(PP)}$ = 20 V, f = 1 kHz, $R_S$ = 25 Ω | $A_{VD}$ = 10, $R_L$ = 2 kΩ, | 25°C | | 0.008% | | | 0.008% | | |
| $B_1$ | Unity-gain bandwidth | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | 8 | 10 | | 8 | 10 | | MHz |
| $B_{OM}$ | Maximum output-swing bandwidth | $V_{O(PP)}$ = 20 V, $R_L$ = 2 kΩ, | $A_{VD}$ = −1, $C_L$ = 25 pF | 25°C | 478 | 637 | | 478 | 637 | | kHz |
| $\phi_m$ | Phase margin at unity gain | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | | 57° | | | 57° | | |

† Full range is 0°C to 70°C.

## TLE2082I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V (unless otherwise noted)

| PARAMETER | | | TEST CONDITIONS | | $T_A$† | TLE2082I | | | TLE2082AI | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | | $V_{IC}$ = 0, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | | 0.9 | 7 | | 0.65 | 4 | mV |
| | | | | | Full range | | | 8.5 | | | 5.5 | |
| $\alpha_{VIO}$ | Temperature coefficient of input offset voltage | | | | Full range | | 2.4 | 25 | | 2.4 | 25 | µV/°C |
| $I_{IO}$ | Input offset current | | $V_{IC}$ = 0, $V_O$ = 0, See Figure 4 | | 25°C | | 5 | 100 | | 5 | 100 | pA |
| | | | | | Full range | | | 5 | | | 5 | nA |
| $I_{IB}$ | Input bias current | | | | 25°C | | 15 | 175 | | 15 | 175 | pA |
| | | | | | Full range | | | 10 | | | 10 | nA |
| $V_{ICR}$ | Common-mode input voltage range | | $R_S$ = 50 Ω | | 25°C | 5 to −1 | 5 to −1.9 | | 5 to −1 | 5 to −1.9 | | V |
| | | | | | Full range | 5 to −0.8 | | | 5 to −0.8 | | | |
| $V_{OM+}$ | Maximum positive peak output voltage swing | | $I_O$ = −200 µA | | 25°C | 3.8 | 4.1 | | 3.8 | 4.1 | | V |
| | | | | | Full range | 3.7 | | | 3.7 | | | |
| | | | $I_O$ = −2 mA | | 25°C | 3.5 | 3.9 | | 3.5 | 3.9 | | |
| | | | | | Full range | 3.4 | | | 3.4 | | | |
| | | | $I_O$ = −20 mA | | 25°C | 1.5 | 2.3 | | 1.5 | 2.3 | | |
| | | | | | Full range | 1.5 | | | 1.5 | | | |
| $V_{OM-}$ | Maximum negative peak output voltage swing | | $I_O$ = 200 µA | | 25°C | −3.8 | −4.2 | | −3.8 | −4.2 | | V |
| | | | | | Full range | −3.7 | | | −3.7 | | | |
| | | | $I_O$ = 2 mA | | 25°C | −3.5 | −4.1 | | −3.5 | −4.1 | | |
| | | | | | Full range | −3.4 | | | −3.4 | | | |
| | | | $I_O$ = 20 mA | | 25°C | −1.5 | −2.4 | | −1.5 | −2.4 | | |
| | | | | | Full range | −1.5 | | | −1.5 | | | |
| $A_{VD}$ | Large-signal differential voltage amplification | | $V_O$ = ± 2.3 V | $R_L$ = 600 Ω | 25°C | 80 | 91 | | 80 | 91 | | dB |
| | | | | | Full range | 79 | | | 79 | | | |
| | | | | $R_L$ = 2 kΩ | 25°C | 90 | 100 | | 90 | 100 | | |
| | | | | | Full range | 89 | | | 89 | | | |
| | | | | $R_L$ = 10 kΩ | 25°C | 95 | 106 | | 95 | 106 | | |
| | | | | | Full range | 94 | | | 94 | | | |
| $r_i$ | Input resistance | | $V_{IC}$ = 0 | | 25°C | | $10^{12}$ | | | $10^{12}$ | | Ω |
| $c_i$ | Input capacitance | Common mode | $V_{IC}$ = 0, See Figure 5 | | 25°C | | 11 | | | 11 | | pF |
| | | Differential | | | 25°C | | 2.5 | | | 2.5 | | |
| $z_o$ | Open-loop output impedance | | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMRR | Common-mode rejection ratio | | $V_{IC}$ = $V_{ICR}$min, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 70 | 89 | | 70 | 89 | | dB |
| | | | | | Full range | 68 | | | 68 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | | $V_{CC\pm}$ = ±5 V to ±15 V, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 82 | 99 | | 82 | 99 | | dB |
| | | | | | Full range | 80 | | | 80 | | | |
| $I_{CC}$ | Supply current (both channels) | | $V_O$ = 0, No load | | 25°C | 2.7 | 2.9 | 3.9 | 2.7 | 2.9 | 3.9 | mA |
| | | | | | Full range | | | 3.9 | | | 3.9 | |

† Full range is −40°C to 85°C.

### TLE2082I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V (unless otherwise noted) (continued)

| PARAMETER | | TEST CONDITIONS | | $T_A$ | TLE2082I | | | TLE2082AI | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| | Crosstalk attenuation | $V_{IC}$ = 0, | $R_L$ = 2 kΩ | 25°C | | 120 | | | 120 | | dB |
| $I_{OS}$ | Short-circuit output current | $V_O$ = 0 | $V_{ID}$ = 1 V | 25°C | | –35 | | | –35 | | mA |
| | | | $V_{ID}$ = –1 V | | | 45 | | | 45 | | |

### TLE2082I operating characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2082I | | | TLE2082AI | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR+ | Positive slew rate | $V_{O(PP)}$ = ±2.3 V, $A_{VD}$ = –1, $C_L$ = 100 pF, | $R_L$ = 2 kΩ, See Figure 1 | 25°C | | 35 | | | 35 | | V/μs |
| | | | | Full range | 20 | | | 20 | | | |
| SR– | Negative slew rate | | | 25°C | | 38 | | | 38 | | V/μs |
| | | | | Full range | 20 | | | 20 | | | |
| $t_s$ | Settling time | $A_{VD}$ = –1, 2-V step, $R_L$ = 1 kΩ, $C_L$ = 100 pF | To 10 mV | 25°C | | 0.25 | | | 0.25 | | μs |
| | | | To 1 mV | | | 0.4 | | | 0.4 | | |
| $V_n$ | Equivalent input noise voltage | $R_S$ = 20 Ω, See Figure 3 | f = 10 Hz | 25°C | | 28 | | | 28 | | nV/√Hz |
| | | | f = 10 kHz | | | 11.6 | | | 11.6 | | |
| $V_{N(PP)}$ | Peak-to-peak equivalent input noise voltage | | f = 10 Hz to 10 kHz | 25°C | | 6 | | | 6 | | μV |
| | | | f = 0.1 Hz to 10 Hz | | | 0.6 | | | 0.6 | | |
| $I_n$ | Equivalent input noise current | $V_{IC}$ = 0, | f = 10 kHz | 25°C | | 2.8 | | | 2.8 | | fA/√Hz |
| THD + N | Total harmonic distortion plus noise | $V_{O(PP)}$ = 5 V, f = 1 kHz, $R_S$ = 25 Ω | $A_{VD}$ = 10, $R_L$ = 2 kΩ, | 25°C | | 0.013% | | | 0.013% | | |
| $B_1$ | Unity-gain bandwidth | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | | 9.4 | | | 9.4 | | MHz |
| $B_{OM}$ | Maximum output-swing bandwidth | $V_{O(PP)}$ = 4 V, $R_L$ = 2 kΩ , | $A_{VD}$ = –1, $C_L$ = 25 pF | 25°C | | 2.8 | | | 2.8 | | MHz |
| $\phi_m$ | Phase margin at unity gain | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | | 56° | | | 56° | | |

† Full range is 40°C to 85°C.

## TLE2082I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2082I | | | TLE2082AI | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{IC}$ = 0, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | | 1.1 | 7 | | 0.7 | 4 | mV |
| | | | | Full range | | | 8.5 | | | 5.5 | |
| $\alpha_{VIO}$ | Temperature coefficient of input offset voltage | | | Full range | | 2.4 | 25 | | 2.4 | 25 | µV/°C |
| $I_{IO}$ | Input offset current | $V_{IC}$ = 0, $V_O$ = 0, See Figure 4 | | 25°C | | 6 | 100 | | 6 | 100 | pA |
| | | | | Full range | | | 5 | | | 5 | nA |
| $I_{IB}$ | Input bias current | | | 25°C | | 20 | 175 | | 20 | 175 | pA |
| | | | | Full range | | | 10 | | | 10 | nA |
| $V_{ICR}$ | Common-mode input voltage range | $R_S$ = 50 Ω | | 25°C | 15 to −11 | 15 to −11.9 | | 15 to −11 | 15 to −11.9 | | V |
| | | | | Full range | 15 to −10.8 | | | 15 to −10.8 | | | |
| $V_{OM+}$ | Maximum positive peak output voltage swing | $I_O$ = −200 µA | | 25°C | 13.8 | 14.1 | | 13.8 | 14.1 | | V |
| | | | | Full range | 13.7 | | | 13.7 | | | |
| | | $I_O$ = −2 mA | | 25°C | 13.5 | 13.9 | | 13.5 | 13.9 | | |
| | | | | Full range | 13.4 | | | 13.4 | | | |
| | | $I_O$ = −20 mA | | 25°C | 11.5 | 12.3 | | 11.5 | 12.3 | | |
| | | | | Full range | 11.5 | | | 11.5 | | | |
| $V_{OM-}$ | Maximum negative peak output voltage swing | $I_O$ = 200 µA | | 25°C | −13.8 | −14.2 | | −13.8 | −14.2 | | V |
| | | | | Full range | −13.7 | | | −13.7 | | | |
| | | $I_O$ = 2 mA | | 25°C | −13.5 | −14 | | −13.5 | −14 | | |
| | | | | Full range | −13.4 | | | −13.4 | | | |
| | | $I_O$ = 20 mA | | 25°C | −11.5 | −12.4 | | −11.5 | −12.4 | | |
| | | | | Full range | −11.5 | | | −11.5 | | | |
| $A_{VD}$ | Large-signal differential voltage amplification | $V_O$ = ± 10 V | $R_L$ = 600 Ω | 25°C | 80 | 96 | | 80 | 96 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| | | | $R_L$ = 2 kΩ | 25°C | 90 | 109 | | 90 | 109 | | |
| | | | | Full range | 89 | | | 89 | | | |
| | | | $R_L$ = 10 kΩ | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | | Full range | 94 | | | 94 | | | |
| $r_i$ | Input resistance | $V_{IC}$ = 0 | | 25°C | | $10^{12}$ | | | $10^{12}$ | | Ω |
| $c_i$ | Input capacitance | Common mode | $V_{IC}$ = 0, See Figure 5 | 25°C | | 7.5 | | | 7.5 | | pF |
| | | Differential | | 25°C | | 2.5 | | | 2.5 | | |
| $z_o$ | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMRR | Common-mode rejection ratio | $V_{IC}$ = $V_{ICR}$min, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 80 | 98 | | 80 | 98 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm}$ = ±5 V to ±15 V, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 82 | 99 | | 82 | 99 | | dB |
| | | | | Full range | 80 | | | 80 | | | |

† Full range is −40°C to 85°C.

### TLE2082I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V (unless otherwise noted) (continued)

| PARAMETER | | TEST CONDITIONS | | $T_A$ | TLE2082I | | | TLE2082AI | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $I_{CC}$ | Supply current (both channels) | $V_O$ = 0, | No load | 25°C | 2.7 | 3.1 | 3.9 | 2.7 | 3.1 | 3.9 | mA |
| | | | | Full range | | | 3.9 | | | 3.9 | |
| | Crosstalk attenuation | $V_{IC}$ = 0, | $R_L$ = 2 kΩ | 25°C | | 120 | | | 120 | | dB |
| $I_{OS}$ | Short-circuit output current | $V_O$ = 0 | $V_{ID}$ = 1 V | 25°C | –30 | –45 | | –30 | –45 | | mA |
| | | | $V_{ID}$ = –1 V | | 30 | 48 | | 30 | 48 | | |

### TLE2082I operating characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2082I | | | TLE2082AI | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR+ | Positive slew rate | $V_{O(PP)}$ = 10 V, $R_L$ = 2 kΩ, See Figure 1 | $A_{VD}$ = –1, $C_L$ = 100 pF, | 25°C | 28 | 40 | | 28 | 40 | | V/μs |
| | | | | Full range | 22 | | | 22 | | | |
| SR– | Negative slew rate | | | 25°C | 30 | 45 | | 30 | 45 | | V/μs |
| | | | | Full range | 22 | | | 22 | | | |
| $t_s$ | Settling time | $A_{VD}$ = –1, 10-V step, $R_L$ = 1 kΩ, $C_L$ = 100 pF | To 10 mV | 25°C | | 0.4 | | | 0.4 | | μs |
| | | | To 1 mV | | | 1.5 | | | 1.5 | | |
| $V_n$ | Equivalent input noise voltage | $R_S$ = 20 Ω, See Figure 3 | f = 10 Hz | 25°C | | 28 | | | 28 | | nV/√Hz |
| | | | f = 10 kHz | | | 11.6 | | | 11.6 | | |
| $V_{N(PP)}$ | Peak-to-peak equivalent input noise voltage | | f = 10 Hz to 10 kHz | 25°C | | 6 | | | 6 | | μV |
| | | | f = 0.1 Hz to 10 Hz | | | 0.6 | | | 0.6 | | |
| $I_n$ | Equivalent input noise current | $V_{IC}$ = 0, | f = 10 kHz | 25°C | | 2.8 | | | 2.8 | | fA/√Hz |
| THD + N | Total harmonic distortion plus noise | $V_{O(PP)}$ = 20 V, f = 1 kHz, $R_S$ = 25 Ω | $A_{VD}$ = 10, $R_L$ = 2 kΩ, | 25°C | | 0.008% | | | 0.008% | | |
| $B_1$ | Unity-gain bandwidth | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | 8 | 10 | | 8 | 10 | | MHz |
| $B_{OM}$ | Maximum output-swing bandwidth | $V_{O(PP)}$ = 20 V, $R_L$ = 2 kΩ, | $A_{VD}$ = –1, $C_L$ = 25 pF | 25°C | 478 | 637 | | 478 | 637 | | kHz |
| $\phi_m$ | Phase margin at unity gain | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | | 57° | | | 57° | | |

† Full range is –40°C to 85°C.

## TLE2082M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2082M | | | TLE2082AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{IC}$ = 0, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | | 0.9 | 7 | | 0.65 | 4 | mV |
| | | | | Full range | | | 9.5 | | | 6.5 | |
| $\alpha_{VIO}$ | Temperature coefficient of input offset voltage | | | Full range | | 2.3 | 25* | | 2.3 | 25* | µV/°C |
| $I_{IO}$ | Input offset current | $V_{IC}$ = 0, $V_O$ = 0, See Figure 4 | | 25°C | | 5 | 100 | | 5 | 100 | pA |
| | | | | Full range | | | 20 | | | 20 | nA |
| $I_{IB}$ | Input bias current | | | 25°C | | 15 | 175 | | 15 | 175 | pA |
| | | | | Full range | | | 60 | | | 60 | nA |
| $V_{ICR}$ | Common-mode input voltage range | $R_S$ = 50 Ω | | 25°C | 5 to −1 | 5 to −1.9 | | 5 to −1 | 5 to −1.9 | | V |
| | | | | Full range | 5 to −0.8 | | | 5 to −0.8 | | | |
| $V_{OM+}$ | Maximum positive peak output voltage swing | $I_O$ = −200 µA | | 25°C | 3.8 | 4.1 | | 3.8 | 4.1 | | V |
| | | | | Full range | 3.6 | | | 3.6 | | | |
| | | $I_O$ = −2 mA | | 25°C | 3.5 | 3.9 | | 3.5 | 3.9 | | |
| | | | | Full range | 3.3 | | | 3.3 | | | |
| | | $I_O$ = −20 mA | | 25°C | 1.5 | 2.3 | | 1.5 | 2.3 | | |
| | | | | Full range | 1.4 | | | 1.4 | | | |
| $V_{OM-}$ | Maximum negative peak output voltage swing | $I_O$ = 200 µA | | 25°C | −3.8 | −4.2 | | −3.8 | −4.2 | | V |
| | | | | Full range | −3.6 | | | −3.6 | | | |
| | | $I_O$ = 2 mA | | 25°C | −3.5 | −4.1 | | −3.5 | −4.1 | | |
| | | | | Full range | −3.3 | | | −3.3 | | | |
| | | $I_O$ = 20 mA | | 25°C | −1.5 | −2.4 | | −1.5 | −2.4 | | |
| | | | | Full range | −1.4 | | | −1.4 | | | |
| $A_{VD}$ | Large-signal differential voltage amplification | $V_O$ = ± 2.3 V | $R_L$ = 600 Ω | 25°C | 80 | 91 | | 80 | 91 | | dB |
| | | | | Full range | 78 | | | 78 | | | |
| | | | $R_L$ = 2 kΩ | 25°C | 90 | 100 | | 90 | 100 | | |
| | | | | Full range | 88 | | | 88 | | | |
| | | | $R_L$ = 10 kΩ | 25°C | 95 | 106 | | 95 | 106 | | |
| | | | | Full range | 93 | | | 93 | | | |
| $r_i$ | Input resistance | $V_{IC}$ = 0 | | 25°C | | $10^{12}$ | | | $10^{12}$ | | Ω |
| $c_i$ | Input capacitance, Common mode | $V_{IC}$ = 0, See Figure 5 | | 25°C | | 11 | | | 11 | | pF |
| | Input capacitance, Differential | | | 25°C | | 2.5 | | | 2.5 | | |
| $z_o$ | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMRR | Common-mode rejection ratio | $V_{IC}$ = $V_{ICR}$min, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 70 | 89 | | 70 | 89 | | dB |
| | | | | Full range | 68 | | | 68 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}$ / $\Delta V_{IO}$) | $V_{CC\pm}$ = ±5 V to ±15 V, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 82 | 99 | | 82 | 99 | | dB |
| | | | | Full range | 80 | | | 80 | | | |

*On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested.
† Full range is −55°C to 125°C.

### TLE2082M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V (unless otherwise noted) (continued)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2082M | | | TLE2082AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $I_{CC}$ | Supply current (both channels) | $V_O$ = 0, | No load | 25°C | 2.7 | 2.9 | 3.6 | 2.7 | 2.9 | 3.6 | mA |
| | | | | Full range | | | 3.6 | | | 3.6 | |
| | Crosstalk attenuation | $V_{IC}$ = 0, | $R_L$ = 2 kΩ | 25°C | | 120 | | | 120 | | dB |
| $I_{OS}$ | Short-circuit output current | $V_O$ = 0 | $V_{ID}$ = 1 V | 25°C | | –35 | | | –35 | | mA |
| | | | $V_{ID}$ = –1 V | | | 45 | | | 45 | | |

† Full range is –55°C to 125°C.

### TLE2082M operating characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2082M | | | TLE2082AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR+ | Positive slew rate | $V_{O(PP)}$ = ±2.3 V, $A_{VD}$ = –1, $C_L$ = 100 pF, | $R_L$ = 2 kΩ, See Figure 1 | 25°C | | 35 | | | 35 | | V/μs |
| | | | | Full range | 18* | | | 18* | | | |
| SR– | Negative slew rate | | | 25°C | | 38 | | | 38 | | V/μs |
| | | | | Full range | 18* | | | 18* | | | |
| $t_s$ | Settling time | $A_{VD}$ = –1, 2-V step, $R_L$ = 1 kΩ, $C_L$ = 100 pF | To 10 mV | 25°C | | 0.25 | | | 0.25 | | μs |
| | | | To 1 mV | | | 0.4 | | | 0.4 | | |
| $V_n$ | Equivalent input noise voltage | $R_S$ = 20 Ω, See Figure 3 | f = 10 Hz | 25°C | | 28 | | | 28 | | nV/√Hz |
| | | | f = 10 kHz | | | 11.6 | | | 11.6 | | |
| $V_{N(PP)}$ | Peak-to-peak equivalent input noise voltage | | f = 10 Hz to 10 kHz | 25°C | | 6 | | | 6 | | μV |
| | | | f = 0.1 Hz to 10 Hz | | | 0.6 | | | 0.6 | | |
| $I_n$ | Equivalent input noise current | $V_{IC}$ = 0, | f = 10 kHz | 25°C | | 2.8 | | | 2.8 | | fA/√Hz |
| THD + N | Total harmonic distortion plus noise | $V_{O(PP)}$ = 5 V, f = 1 kHz, $R_S$ = 25 Ω | $A_{VD}$ = 10, $R_L$ = 2 kΩ, | 25°C | | 0.013% | | | 0.013% | | |
| $B_1$ | Unity-gain bandwidth | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | | 9.4 | | | 9.4 | | MHz |
| $B_{OM}$ | Maximum output-swing bandwidth | $V_{O(PP)}$ = 4 V, $R_L$ = 2 kΩ , | $A_{VD}$ = –1, $C_L$ = 25 pF | 25°C | | 2.8 | | | 2.8 | | MHz |
| $\phi_m$ | Phase margin at unity gain | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | | 56° | | | 56° | | |

*On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested.
† Full range is –55°C to 125°C.

## TLE2082M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2082M | | | TLE2082AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{IC}$ = 0, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | | 1.1 | 7 | | 0.7 | 4 | mV |
| | | | | Full range | | | 9.5 | | | 6.5 | |
| $\alpha_{VIO}$ | Temperature coefficient of input offset voltage | | | Full range | | 2.4 | 25* | | 2.4 | 25* | μV/°C |
| $I_{IO}$ | Input offset current | $V_{IC}$ = 0, $V_O$ = 0, See Figure 4 | | 25°C | | 6 | 100 | | 6 | 100 | pA |
| | | | | Full range | | | 20 | | | 20 | nA |
| $I_{IB}$ | Input bias current | | | 25°C | | 20 | 175 | | 20 | 175 | pA |
| | | | | Full range | | | 65 | | | 65 | nA |
| $V_{ICR}$ | Common-mode input voltage range | $R_S$ = 50 Ω | | 25°C | 15 to −11 | 15 to −11.9 | | 15 to −11 | 15 to −11.9 | | V |
| | | | | Full range | 15 to −10.8 | | | 15 to −10.8 | | | |
| $V_{OM+}$ | Maximum positive peak output voltage swing | $I_O$ = −200 μA | | 25°C | 13.8 | 14.1 | | 13.8 | 14.1 | | V |
| | | | | Full range | 13.6 | | | 13.6 | | | |
| | | $I_O$ = −2 mA | | 25°C | 13.5 | 13.9 | | 13.5 | 13.9 | | |
| | | | | Full range | 13.3 | | | 13.3 | | | |
| | | $I_O$ = −20 mA | | 25°C | 11.5 | 12.3 | | 11.5 | 12.3 | | |
| | | | | Full range | 11.4 | | | 11.4 | | | |
| $V_{OM-}$ | Maximum negative peak output voltage swing | $I_O$ = 200 μA | | 25°C | −13.8 | −14.2 | | −13.8 | −14.2 | | V |
| | | | | Full range | −13.6 | | | −13.6 | | | |
| | | $I_O$ = 2 mA | | 25°C | −13.5 | −14 | | −13.5 | −14 | | |
| | | | | Full range | −13.3 | | | −13.3 | | | |
| | | $I_O$ = 20 mA | | 25°C | −11.5 | −12.4 | | −11.5 | −12.4 | | |
| | | | | Full range | −11.4 | | | −11.4 | | | |
| $A_{VD}$ | Large-signal differential voltage amplification | $V_O$ = ± 10 V | $R_L$ = 600 Ω | 25°C | 80 | 96 | | 80 | 96 | | dB |
| | | | | Full range | 78 | | | 78 | | | |
| | | | $R_L$ = 2 kΩ | 25°C | 90 | 109 | | 90 | 109 | | |
| | | | | Full range | 88 | | | 88 | | | |
| | | | $R_L$ = 10 kΩ | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | | Full range | 93 | | | 93 | | | |
| $r_i$ | Input resistance | | $V_{IC}$ = 0 | 25°C | | $10^{12}$ | | | $10^{12}$ | | Ω |
| $c_i$ | Input capacitance | Common mode | $V_{IC}$ = 0, See Figure 5 | 25°C | | 7.5 | | | 7.5 | | pF |
| | | Differential | | 25°C | | 2.5 | | | 2.5 | | |
| $z_o$ | Open-loop output impedance | | f = 1 MHz | 25°C | | 80 | | | 80 | | Ω |
| CMRR | Common-mode rejection ratio | $V_{IC}$ = $V_{ICR}$min, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 80 | 98 | | 80 | 98 | | dB |
| | | | | Full range | 78 | | | 78 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm}$ = ±5 V to ±15 V, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 82 | 99 | | 82 | 99 | | dB |
| | | | | Full range | 80 | | | 80 | | | |

*On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested.
† Full range is −55°C to 125°C.

### TLE2082M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V (unless otherwise noted) (continued)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2082M | | | TLE2082AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $I_{CC}$ | Supply current (both channels) | $V_O$ = 0, | No load | 25°C | 2.7 | 3.1 | 3.6 | 2.7 | 3.1 | 3.6 | mA |
| | | | | Full range | | | 3.6 | | | 3.6 | |
| | Crosstalk attenuation | $V_{IC}$ = 0, | $R_L$ = 2 kΩ | 25°C | | 120 | | | 120 | | dB |
| $I_{OS}$ | Short-circuit output current | $V_O$ = 0 | $V_{ID}$ = 1 V | 25°C | –30 | –45 | | –30 | –45 | | mA |
| | | | $V_{ID}$ = –1 V | | 30 | 48 | | 30 | 48 | | |

† Full range is –55°C to 125°C.

### TLE2082M operating characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2082M | | | TLE2082AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR+ | Positive slew rate | $V_{O(PP)}$ = 10 V, $R_L$ = 2 kΩ, See Figure 1 | $A_{VD}$ = –1, $C_L$ = 100 pF, | 25°C | 28 | 40 | | 28 | 40 | | V/μs |
| | | | | Full range | 20 | | | 20 | | | |
| SR– | Negative slew rate | | | 25°C | 30 | 45 | | 30 | 45 | | V/μs |
| | | | | Full range | 20 | | | 20 | | | |
| $t_s$ | Settling time | $A_{VD}$ = –1, 10-V step, $R_L$ = 1 kΩ, $C_L$ = 100 pF | To 10 mV | 25°C | | 0.4 | | | 0.4 | | μs |
| | | | To 1 mV | | | 1.5 | | | 1.5 | | |
| $V_n$ | Equivalent input noise voltage | $R_S$ = 20 Ω, See Figure 3 | f = 10 Hz | 25°C | | 28 | | | 28 | | nV/√Hz |
| | | | f = 10 kHz | | | 11.6 | | | 11.6 | | |
| $V_{N(PP)}$ | Peak-to-peak equivalent input noise voltage | | f = 10 Hz to 10 kHz | 25°C | | 6 | | | 6 | | μV |
| | | | f = 0.1 Hz to 10 Hz | | | 0.6 | | | 0.6 | | |
| $I_n$ | Equivalent input noise current | $V_{IC}$ = 0, | f = 10 kHz | 25°C | | 2.8 | | | 2.8 | | fA/√Hz |
| THD + N | Total harmonic distortion plus noise | $V_{O(PP)}$ = 20 V, f = 1 kHz, $R_S$ = 25 Ω | $A_{VD}$ = 10, $R_L$ = 2 kΩ, | 25°C | | 0.008% | | | 0.008% | | |
| $B_1$ | Unity-gain bandwidth | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | 8* | 10 | | 8* | 10 | | MHz |
| $B_{OM}$ | Maximum output-swing bandwidth | $V_{O(PP)}$ = 20 V, $R_L$ = 2 kΩ, | $A_{VD}$ = –1, $C_L$ = 25 pF | 25°C | 478* | 637 | | 478* | 637 | | kHz |
| $\phi_m$ | Phase margin at unity gain | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | | 57° | | | 57° | | |

*On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested.
† Full range is –55°C to 125°C.

## TLE2082Y electrical characteristics at $V_{CC\pm}$ = ±15 V, $T_A$ = 25°C

| PARAMETER | | | TEST CONDITIONS | | | TLE2082Y MIN | TLE2082Y TYP | TLE2082Y MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| $V_{IO}$ | Input offset voltage | | $V_{IC}$ = 0, | $V_O$ = 0, | $R_S$ = 50 Ω | | 1.1 | 6 | mV |
| $I_{IO}$ | Input offset current | | $V_{IC}$ = 0, | $V_O$ = 0, | See Figure 4 | | 6 | 100 | pA |
| $I_{IB}$ | Input bias current | | | | | | 20 | 175 | pA |
| $V_{ICR}$ | Common-mode input voltage range | | $R_S$ = 50 Ω | | | 15 to −11 | 15 to 11.9 | | V |
| $V_{OM+}$ | Maximum positive peak output voltage swing | | $I_O$ = −200 µA | | | 13.8 | 14.1 | | V |
| | | | $I_O$ = −2 mA | | | 13.5 | 13.9 | | |
| | | | $I_O$ = −20 mA | | | 11.5 | 12.3 | | |
| $V_{OM-}$ | Maximum negative peak output voltage swing | | $I_O$ = 200 µA | | | −13.8 | −14.2 | | V |
| | | | $I_O$ = 2 mA | | | −13.5 | −14 | | |
| | | | $I_O$ = 20 mA | | | −11.5 | −12.4 | | |
| $A_{VD}$ | Large-signal differential voltage amplification | | $V_O$ = ± 10 V | $R_L$ = 600 Ω | | 80 | 96 | | dB |
| | | | | $R_L$ = 2 kΩ | | 90 | 109 | | |
| | | | | $R_L$ = 10 kΩ | | 95 | 118 | | |
| $r_i$ | Input resistance | | $V_{IC}$ = 0 | | | | $10^{12}$ | | Ω |
| $c_i$ | Input capacitance | Common mode | $V_O$ = 0, | See Figure 5 | | | 7.5 | | pF |
| | | Differential | | | | | 2.5 | | |
| $z_o$ | Open-loop output impedance | | f = 1 MHz | | | | 80 | | Ω |
| CMRR | Common-mode rejection ratio | | $V_{IC}$ = $V_{ICR}$min, | $V_O$ = 0, | $R_S$ = 50 Ω | 80 | 98 | | dB |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | | $V_{CC\pm}$ = ±5 V to ±15 V, $R_S$ = 50 Ω | | $V_O$ = 0, | 82 | 99 | | dB |
| $I_{CC}$ | Supply current (both channels) | | $V_O$ = 0, | No load | | 2.7 | 3.1 | 3.9 | mA |
| $I_{OS}$ | Short-circuit output current | | $V_O$ = 0 | $V_{ID}$ = 1 V | | −30 | −45 | | mA |
| | | | | $V_{ID}$ = −1 V | | 30 | 48 | | |

**TLE2084C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V (unless otherwise noted)**

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2084C | | | TLE2084AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{IC}$ = 0, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | | –1.6 | 7 | | –0.5 | 4 | mV |
| | | | | Full range | | | 9.1 | | | 6.1 | |
| $\alpha_{VIO}$ | Temperature coefficient of input offset voltage | | | Full range | | 10.1 | 30 | | 10.1 | 30 | μV/°C |
| $I_{IO}$ | Input offset current | $V_{IC}$ = 0, $V_O$ = 0, See Figure 4 | | 25°C | | 15 | 100 | | 15 | 100 | pA |
| | | | | Full range | | | 1.4 | | | 1.4 | nA |
| $I_{IB}$ | Input bias current | | | 25°C | | 20 | 175 | | 20 | 175 | pA |
| | | | | Full range | | | 5 | | | 5 | nA |
| $V_{ICR}$ | Common-mode input voltage range | $R_S$ = 50 Ω | | 25°C | 5 to –1 | 5 to –1.9 | | 5 to –1 | 5 to –1.9 | | V |
| | | | | Full range | 5 to –0.9 | | | 5 to –0.9 | | | |
| $V_{OM+}$ | Maximum positive peak output voltage swing | $I_O$ = –200 μA | | 25°C | 3.8 | 4.1 | | 3.8 | 4.1 | | V |
| | | | | Full range | 3.7 | | | 3.7 | | | |
| | | $I_O$ = –2 mA | | 25°C | 3.5 | 3.9 | | 3.5 | 3.9 | | |
| | | | | Full range | 3.4 | | | 3.4 | | | |
| | | $I_O$ = –20 mA | | 25°C | 1.5 | 2.3 | | 1.5 | 2.3 | | |
| | | | | Full range | 1.5 | | | 1.5 | | | |
| $V_{OM-}$ | Maximum negative peak output voltage swing | $I_O$ = 200 μA | | 25°C | –3.8 | –4.2 | | –3.8 | –4.2 | | V |
| | | | | Full range | –3.7 | | | –3.7 | | | |
| | | $I_O$ = 2 mA | | 25°C | –3.5 | –4.1 | | –3.5 | –4.1 | | |
| | | | | Full range | –3.4 | | | –3.4 | | | |
| | | $I_O$ = 20 mA | | 25°C | –1.5 | –2.4 | | –1.5 | –2.4 | | |
| | | | | Full range | –1.5 | | | –1.5 | | | |
| $A_{VD}$ | Large-signal differential voltage amplification | $V_O$ = ± 2.3 V | $R_L$ = 600 Ω | 25°C | 80 | 91 | | 80 | 91 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| | | | $R_L$ = 2 kΩ | 25°C | 90 | 100 | | 90 | 100 | | |
| | | | | Full range | 89 | | | 89 | | | |
| | | | $R_L$ = 10 kΩ | 25°C | 95 | 106 | | 95 | 106 | | |
| | | | | Full range | 94 | | | 94 | | | |
| $r_i$ | Input resistance | $V_{IC}$ = 0 | | 25°C | | $10^{12}$ | | | $10^{12}$ | | Ω |
| $c_i$ | Input capacitance | $V_{IC}$ = 0, See Figure 5 | Common mode | 25°C | | 11 | | | 11 | | pF |
| | | | Differential | 25°C | | 2.5 | | | 2.5 | | |
| $z_o$ | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMRR | Common-mode rejection ratio | $V_{IC}$ = $V_{ICR}$min, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 70 | 89 | | 70 | 89 | | dB |
| | | | | Full range | 68 | | | 68 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}$ /$\Delta V_{IO}$) | $V_{CC\pm}$ = ±5 V to ±15 V, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 82 | 99 | | 82 | 99 | | dB |
| | | | | Full range | 80 | | | 80 | | | |
| $I_{CC}$ | Supply current (four amplifiers) | $V_O$ = 0, No load | | 25°C | 5.2 | 6.3 | 7.5 | 5.2 | 6.3 | 7.5 | mA |
| | | | | Full range | | | 7.5 | | | 7.5 | |
| $a_X$ | Crosstalk attenuation | $V_{IC}$ = 0, $R_L$ = 2 kΩ | | 25°C | | 120 | | | 120 | | dB |

† Full range is 0°C to 70°C.

### TLE2084C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V (unless otherwise noted) (continued)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2084C | | | TLE2084AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $I_{OS}$ | Short-circuit output current | $V_O$ = 0 | $V_{ID}$ = 1 V | 25°C | | –35 | | | –35 | | mA |
| | | | $V_{ID}$ = –1 V | | | 45 | | | 45 | | |

† Full range is 0°C to 70°C.

### TLE2084C operating characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2084C | | | TLE2084AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR+ | Positive slew rate | $V_{O(PP)}$ = ±2.3 V, $A_{VD}$ = –1, $C_L$ = 100 pF, | $R_L$ = 2 kΩ, See Figure 1 | 25°C | | 35 | | | 35 | | V/µs |
| | | | | Full range | 22 | | | 22 | | | |
| SR– | Negative slew rate | | | 25°C | | 38 | | | 38 | | V/µs |
| | | | | Full range | 22 | | | 22 | | | |
| $t_s$ | Settling time | $A_{VD}$ = –1, 2-V step, $R_L$ = 1 kΩ, $C_L$ = 100 pF | To 10 mV | 25°C | | 0.25 | | | 0.25 | | µs |
| | | | To 1 mV | | | 0.4 | | | 0.4 | | |
| $V_n$ | Equivalent input noise voltage | $R_S$ = 20 Ω, See Figure 3 | f = 10 Hz | 25°C | | 28 | | | 28 | | nV/√Hz |
| | | | f = 10 kHz | | | 11.6 | | | 11.6 | | |
| $V_{N(PP)}$ | Peak-to-peak equivalent input noise voltage | | f = 10 Hz to 10 kHz | 25°C | | 6 | | | 6 | | µV |
| | | | f = 0.1Hz to 10 Hz | | | 0.6 | | | 0.6 | | |
| $I_n$ | Equivalent input noise current | $V_{IC}$ = 0, | f = 10 kHz | 25°C | | 2.8 | | | 2.8 | | fA/√Hz |
| THD + N | Total harmonic distortion plus noise | $V_{O(PP)}$ = 5 V, f = 1 kHz, $R_S$ = 25 Ω | $A_{VD}$ = 10, $R_L$ = 2 kΩ, | 25°C | | 0.013% | | | 0.013% | | |
| $B_1$ | Unity-gain bandwidth | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | | 9.4 | | | 9.4 | | MHz |
| $B_{OM}$ | Maximum output-swing bandwidth | $V_{O(PP)}$ = 4 V, $R_L$ = 2 kΩ , | $A_{VD}$ = –1, $C_L$ = 25 pF | 25°C | | 2.8 | | | 2.8 | | MHz |
| $\phi_m$ | Phase margin at unity gain | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | | 56° | | | 56° | | |

† Full range is 0°C to 70°C.

## TLE2084C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2084C | | | TLE2084AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{IC}$ = 0, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | | –1.6 | 7 | | –0.5 | 4 | mV |
| | | | | Full range | | | 9.1 | | | 6.1 | |
| $\alpha_{VIO}$ | Temperature coefficient of input offset voltage | | | Full range | | 10.1 | 30 | | 10.1 | 30 | μV/°C |
| $I_{IO}$ | Input offset current | $V_{IC}$ = 0, $V_O$ = 0, See Figure 4 | | 25°C | | 15 | 100 | | 15 | 100 | pA |
| | | | | Full range | | | 1.4 | | | 1.4 | nA |
| $I_{IB}$ | Input bias current | | | 25°C | | 25 | 175 | | 25 | 175 | pA |
| | | | | Full range | | | 5 | | | 5 | nA |
| $V_{ICR}$ | Common-mode input voltage range | $R_S$ = 50 Ω | | 25°C | 15 to –11 | 15 to –11.9 | | 15 to –11 | 15 to –11.9 | | V |
| | | | | Full range | 15 to –10.9 | | | 15 to –10.9 | | | |
| $V_{OM+}$ | Maximum positive peak output voltage swing | $I_O$ = –200 μA | | 25°C | 13.8 | 14.1 | | 13.8 | 14.1 | | V |
| | | | | Full range | 13.7 | | | 13.7 | | | |
| | | $I_O$ = –2 mA | | 25°C | 13.5 | 13.9 | | 13.5 | 13.9 | | |
| | | | | Full range | 13.4 | | | 13.4 | | | |
| | | $I_O$ = –20 mA | | 25°C | 11.5 | 12.3 | | 11.5 | 12.3 | | |
| | | | | Full range | 11.5 | | | 11.5 | | | |
| $V_{OM-}$ | Maximum negative peak output voltage swing | $I_O$ = 200 μA | | 25°C | –13.8 | –14.2 | | –13.8 | –14.2 | | V |
| | | | | Full range | –13.7 | | | –13.7 | | | |
| | | $I_O$ = 2 mA | | 25°C | –13.7 | –14 | | –13.7 | –14 | | |
| | | | | Full range | –13.6 | | | –13.6 | | | |
| | | $I_O$ = 20 mA | | 25°C | –11.5 | –12.4 | | –11.5 | –12.4 | | |
| | | | | Full range | –11.5 | | | –11.5 | | | |
| $A_{VD}$ | Large-signal differential voltage amplification | $V_O$ = ± 10 V | $R_L$ = 600 Ω | 25°C | 80 | 96 | | 80 | 96 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| | | | $R_L$ = 2 kΩ | 25°C | 90 | 109 | | 90 | 109 | | |
| | | | | Full range | 89 | | | 89 | | | |
| | | | $R_L$ = 10 kΩ | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | | Full range | 94 | | | 94 | | | |
| $r_i$ | Input resistance | $V_{IC}$ = 0 | | 25°C | | $10^{12}$ | | | $10^{12}$ | | Ω |
| $c_i$ | Input capacitance | $V_{IC}$ = 0, See Figure 5 | Common mode | 25°C | | 7.5 | | | 7.5 | | pF |
| | | | Differential | 25°C | | 2.5 | | | 2.5 | | |
| $z_o$ | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMRR | Common-mode rejection ratio | $V_{IC}$ = $V_{ICR}$min, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 80 | 98 | | 80 | 98 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm}$ = ±5 V to ±15 V, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 82 | 99 | | 82 | 99 | | dB |
| | | | | Full range | 81 | | | 81 | | | |
| $I_{CC}$ | Supply current (four amplifiers) | $V_O$ = 0, No load | | 25°C | 5.2 | 6.5 | 7.5 | 5.2 | 6.5 | 7.5 | mA |
| | | | | Full range | | | 7.5 | | | 7.5 | |
| $a_X$ | Crosstalk attenuation | $V_{IC}$ = 0, $R_L$ = 2 kΩ | | 25°C | | 120 | | | 120 | | dB |

† Full range is 0°C to 70°C.

### TLE2084C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V (unless otherwise noted) (continued)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2084C | | | TLE2084AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $I_{OS}$ | Short-circuit output current | $V_O$ = 0 | $V_{ID}$ = 1 V | 25°C | –30 | –45 | | –30 | –45 | | mA |
| | | | $V_{ID}$ = –1 V | | 30 | 48 | | 30 | 48 | | |

† Full range is 0°C to 70°C.

### TLE2084C operating characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2084C | | | TLE2084AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR+ | Positive slew rate | $V_{O(PP)}$ = 10 V, $R_L$ = 2 kΩ, See Figure 1 | $A_{VD}$ = –1, $C_L$ = 100 pF, | 25°C | 25 | 40 | | 25 | 40 | | V/µs |
| | | | | Full range | 22 | | | 22 | | | |
| SR– | Negative slew rate | | | 25°C | 30 | 45 | | 30 | 45 | | V/µs |
| | | | | Full range | 25 | | | 25 | | | |
| $t_s$ | Settling time | $A_{VD}$ = –1, 10-V step, $R_L$ = 1 kΩ, $C_L$ = 100 pF | To 10 mV | 25°C | | 0.4 | | | 0.4 | | µs |
| | | | To 1 mV | | | 1.5 | | | 1.5 | | |
| $V_n$ | Equivalent input noise voltage | $R_S$ = 20 Ω, See Figure 3 | f = 10 Hz | 25°C | | 28 | | | 28 | | nV/√Hz |
| | | | f = 10 kHz | | | 11.6 | | | 11.6 | | |
| $V_{N(PP)}$ | Peak-to-peak equivalent input noise voltage | | f = 10 Hz to 10 kHz | 25°C | | 6 | | | 6 | | µV |
| | | | f = 0.1 Hz to 10 Hz | | | 0.6 | | | 0.6 | | |
| $I_n$ | Equivalent input noise current | $V_{IC}$ = 0, | f = 10 kHz | 25°C | | 2.8 | | | 2.8 | | fA/√Hz |
| THD + N | Total harmonic distortion plus noise | $V_{O(PP)}$ = 20 V, f = 1 kHz, $R_S$ = 25 Ω | $A_{VD}$ = 10, $R_L$ = 2 kΩ, | 25°C | | 0.008% | | | 0.008% | | |
| $B_1$ | Unity-gain bandwidth | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | 8 | 10 | | 8 | 10 | | MHz |
| $B_{OM}$ | Maximum output-swing bandwidth | $V_{O(PP)}$ = 20 V, $R_L$ = 2 kΩ, | $A_{VD}$ = –1, $C_L$ = 25 pF | 25°C | 478 | 637 | | 478 | 637 | | kHz |
| $\phi_m$ | Phase margin at unity gain | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | | 57° | | | 57° | | |

† Full range is 0°C to 70°C.

**TLE2084M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V (unless otherwise noted)**

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2084M | | | TLE2084AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{IC}$ = 0, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | | –1.6 | 7 | | –0.5 | 4 | mV |
| | | | | Full range | | | 12.5 | | | 9.5 | |
| $\alpha_{VIO}$ | Temperature coefficient of input offset voltage | | | Full range | | 10.1 | 30* | | 10.1 | 30* | μV/°C |
| $I_{IO}$ | Input offset current | $V_{IC}$ = 0, $V_O$ = 0, See Figure 4 | | 25°C | | 15 | 100 | | 15 | 100 | pA |
| | | | | Full range | | | 20 | | | 20 | nA |
| $I_{IB}$ | Input bias current | | | 25°C | | 20 | 175 | | 20 | 175 | pA |
| | | | | Full range | | | 65 | | | 65 | nA |
| $V_{ICR}$ | Common-mode input voltage range | $R_S$ = 50 Ω | | 25°C | 5 to –1 | 5 to –1.9 | | 5 to –1 | 5 to –1.9 | | V |
| | | | | Full range | 5 to –0.8 | | | 5 to –0.8 | | | |
| $V_{OM+}$ | Maximum positive peak output voltage swing | $I_O$ = –200 μA | | 25°C | 3.8 | 4.1 | | 3.8 | 4.1 | | V |
| | | | | Full range | 3.6 | | | 3.6 | | | |
| | | $I_O$ = –2 mA | | 25°C | 3.5 | 3.9 | | 3.5 | 3.9 | | |
| | | | | Full range | 3.3 | | | 3.3 | | | |
| | | $I_O$ = –20 mA | | 25°C | 1.5 | 2.3 | | 1.5 | 2.3 | | |
| | | | | Full range | 1.4 | | | 1.4 | | | |
| $V_{OM-}$ | Maximum negative peak output voltage swing | $I_O$ = 200 μA | | 25°C | –3.8 | –4.2 | | –3.8 | –4.2 | | V |
| | | | | Full range | –3.6 | | | –3.6 | | | |
| | | $I_O$ = 2 mA | | 25°C | –3.5 | –4.1 | | –3.5 | –4.1 | | |
| | | | | Full range | –3.3 | | | –3.3 | | | |
| | | $I_O$ = 20 mA | | 25°C | –1.5 | –2.4 | | –1.5 | –2.4 | | |
| | | | | Full range | –1.4 | | | –1.4 | | | |
| $A_{VD}$ | Large-signal differential voltage amplification | $V_O$ = ± 2.3 V | $R_L$ = 600 Ω | 25°C | 80 | 91 | | 80 | 91 | | dB |
| | | | | Full range | 78 | | | 78 | | | |
| | | | $R_L$ = 2 kΩ | 25°C | 90 | 100 | | 90 | 100 | | |
| | | | | Full range | 88 | | | 88 | | | |
| | | | $R_L$ = 10 kΩ | 25°C | 95 | 106 | | 95 | 106 | | |
| | | | | Full range | 93 | | | 93 | | | |
| $r_i$ | Input resistance | $V_{IC}$ = 0 | | 25°C | | $10^{12}$ | | | $10^{12}$ | | Ω |
| $c_i$ | Input capacitance | $V_{IC}$ = 0, See Figure 5 | Common mode | 25°C | | 11 | | | 11 | | pF |
| | | | Differential | 25°C | | 2.5 | | | 2.5 | | |
| $z_o$ | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMRR | Common-mode rejection ratio | $V_{IC}$ = $V_{ICR}$min, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 70 | 89 | | 70 | 89 | | dB |
| | | | | Full range | 68 | | | 68 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm}$ = ±5 V to ±15 V, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 82 | 99 | | 82 | 99 | | dB |
| | | | | Full range | 80 | | | 80 | | | |
| $I_{CC}$ | Supply current (four amplifiers) | $V_O$ = 0, No load | | 25°C | 5.2 | 6.3 | 7.5 | 5.2 | 6.3 | 7.5 | mA |
| | | | | Full range | | | 7.5 | | | 7.5 | |
| $a_X$ | Crosstalk attenuation | $V_{IC}$ = 0, $R_L$ = 2 kΩ | | 25°C | | 120 | | | 120 | | dB |

*On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested.
† Full range is –55°C to 125°C.

### TLE2084M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V (unless otherwise noted) (continued)

| PARAMETER | | TEST CONDITIONS | | $T_A$ | TLE2084M | | | TLE2084AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $I_{OS}$ | Short-circuit output current | $V_O$ = 0 | $V_{ID}$ = 1 V | 25°C | | –35 | | | –35 | | mA |
| | | | $V_{ID}$ = –1 V | | | 45 | | | 45 | | |

### TLE2084M operating characteristics at specified free-air temperature, $V_{CC\pm}$ = ±5 V

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2084M | | | TLE2084AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR+ | Positive slew rate | $V_{O(PP)}$ = ±2.3 V, $A_{VD}$ = –1, $C_L$ = 100 pF, | $R_L$ = 2 kΩ, See Figure 1 | 25°C | | 35 | | | 35 | | V/μs |
| | | | | Full range | 18* | | | 18* | | | |
| SR– | Negative slew rate | | | 25°C | | 38 | | | 38 | | V/μs |
| | | | | Full range | 18* | | | 18* | | | |
| $t_s$ | Settling time | $A_{VD}$ = –1, 2-V step, $R_L$ = 1 kΩ, $C_L$ = 100 pF | To 10 mV | 25°C | | 0.25 | | | 0.25 | | μs |
| | | | To 1 mV | | | 0.4 | | | 0.4 | | |
| $V_n$ | Equivalent input noise voltage | $R_S$ = 20 Ω, See Figure 3 | f = 10 Hz | 25°C | | 28 | | | 28 | | nV/√Hz |
| | | | f = 10 kHz | | | 11.6 | | | 11.6 | | |
| $V_{N(PP)}$ | Peak-to-peak equivalent input noise voltage | | f = 10 Hz to 10 kHz | 25°C | | 6 | | | 6 | | μV |
| | | | f = 0.1 Hz to 10 Hz | | | 0.6 | | | 0.6 | | |
| $I_n$ | Equivalent input noise current | $V_{IC}$ = 0, | f = 10 kHz | 25°C | | 2.8 | | | 2.8 | | fA/√Hz |
| THD + N | Total harmonic distortion plus noise | $V_{O(PP)}$ = 5 V, f = 1 kHz, $R_S$ = 25 Ω | $A_{VD}$ = 10, $R_L$ = 2 kΩ, | 25°C | | 0.013% | | | 0.013% | | |
| $B_1$ | Unity-gain bandwidth | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | | 9.4 | | | 9.4 | | MHz |
| $B_{OM}$ | Maximum output-swing bandwidth | $V_{O(PP)}$ = 4 V, $R_L$ = 2 kΩ , | $A_{VD}$ = –1, $C_L$ = 25 pF | 25°C | | 2.8 | | | 2.8 | | MHz |
| $\phi_m$ | Phase margin at unity gain | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | | 56° | | | 56° | | |

*On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested.
† Full range is –55°C to 125°C.

## TLE2084M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2084M | | | TLE2084AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{IC}$ = 0, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | | –1.6 | 7 | | –0.5 | 4 | mV |
| | | | | Full range | | | 12.5 | | | 7.5 | |
| $\alpha_{VIO}$ | Temperature coefficient of input offset voltage | | | Full range | | 10.1 | 30* | | 10.1 | 30* | µV/°C |
| $I_{IO}$ | Input offset current | $V_{IC}$ = 0, $V_O$ = 0, See Figure 4 | | 25°C | | 15 | 100 | | 15 | 100 | pA |
| | | | | Full range | | | 20 | | | 20 | nA |
| $I_{IB}$ | Input bias current | | | 25°C | | 25 | 175 | | 25 | 175 | pA |
| | | | | Full range | | | 65 | | | 65 | nA |
| $V_{ICR}$ | Common-mode input voltage range | $R_S$ = 50 Ω | | 25°C | 15 to –11 | 15 to –11.9 | | 15 to –11 | 15 to –11.9 | | V |
| | | | | Full range | 15 to –10.8 | | | 15 to –10.8 | | | |
| $V_{OM+}$ | Maximum positive peak output voltage swing | $I_O$ = –200 µA | | 25°C | 13.8 | 14.1 | | 13.8 | 14.1 | | V |
| | | | | Full range | 13.6 | | | 13.6 | | | |
| | | $I_O$ = –2 mA | | 25°C | 13.5 | 13.9 | | 13.5 | 13.9 | | |
| | | | | Full range | 13.3 | | | 13.3 | | | |
| | | $I_O$ = –20 mA | | 25°C | 11.5 | 12.3 | | 11.5 | 12.3 | | |
| | | | | Full range | 11.4 | | | 11.4 | | | |
| $V_{OM-}$ | Maximum negative peak output voltage swing | $I_O$ = 200 µA | | 25°C | –13.8 | –14.2 | | –13.8 | –14.2 | | V |
| | | | | Full range | –13.6 | | | –13.6 | | | |
| | | $I_O$ = 2 mA | | 25°C | –13.5 | –14 | | –13.5 | –14 | | |
| | | | | Full range | –13.3 | | | –13.3 | | | |
| | | $I_O$ = 20 mA | | 25°C | –11.5 | –12.4 | | –11.5 | –12.4 | | |
| | | | | Full range | –11.4 | | | –11.4 | | | |
| $A_{VD}$ | Large-signal differential voltage amplification | $V_O$ = ± 10 V | $R_L$ = 600 Ω | 25°C | 80 | 96 | | 80 | 96 | | dB |
| | | | | Full range | 78 | | | 78 | | | |
| | | | $R_L$ = 2 kΩ | 25°C | 90 | 109 | | 90 | 109 | | |
| | | | | Full range | 88 | | | 88 | | | |
| | | | $R_L$ = 10 kΩ | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | | Full range | 93 | | | 93 | | | |
| $r_i$ | Input resistance | $V_{IC}$ = 0 | | 25°C | | $10^{12}$ | | | $10^{12}$ | | Ω |
| $c_i$ | Input capacitance | $V_{IC}$ = 0, See Figure 5 | Common mode | 25°C | | 7.5 | | | 7.5 | | pF |
| | | | Differential | 25°C | | 2.5 | | | 2.5 | | |
| $z_o$ | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMRR | Common-mode rejection ratio | $V_{IC}$ = $V_{ICR}$min, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 80 | 98 | | 80 | 98 | | dB |
| | | | | Full range | 78 | | | 78 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm}$ = ±5 V to ±15 V, $V_O$ = 0, $R_S$ = 50 Ω | | 25°C | 82 | 99 | | 82 | 99 | | dB |
| | | | | Full range | 80 | | | 80 | | | |
| $I_{CC}$ | Supply current (four amplifiers) | $V_O$ = 0, No load | | 25°C | 5.2 | 6.5 | 7.5 | 5.2 | 6.5 | 7.5 | mA |
| | | | | Full range | | | 7.5 | | | 7.5 | |
| $a_X$ | Crosstalk attenuation | $V_{IC}$ = 0, $R_L$ = 2 kΩ | | 25°C | | 120 | | | 120 | | dB |

*On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested.
† Full range is –55°C to 125°C.

### TLE2084M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V (unless otherwise noted) (continued)

| PARAMETER | | TEST CONDITIONS | | $T_A$ | TLE2084M | | | TLE2084AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $I_{OS}$ | Short-circuit output current | $V_O$ = 0 | $V_{ID}$ = 1 V | 25°C | –30 | –45 | | –30 | –45 | | mA |
| | | | $V_{ID}$ = –1 V | | 30 | 48 | | 30 | 48 | | |

### TLE2084M operating characteristics at specified free-air temperature, $V_{CC\pm}$ = ±15 V

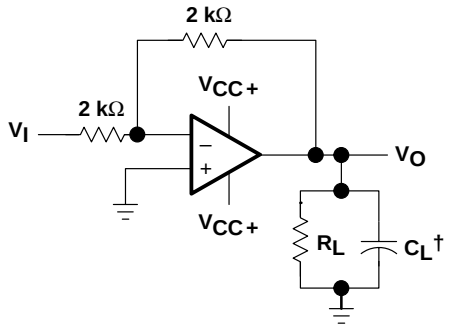
| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2084M | | | TLE2084AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR+ | Positive slew rate | $V_{O(PP)}$ = 10 V, $A_{VD}$ = –1, $C_L$ = 100 pF, | $R_L$ = 2 kΩ, See Figure 1 | 25°C | 25 | 40 | | 25 | 40 | | V/µs |
| | | | | Full range | 17 | | | 17 | | | |
| SR– | Negative slew rate | | | 25°C | 30 | 45 | | 30 | 45 | | V/µs |
| | | | | Full range | 20 | | | 20 | | | |
| $t_s$ | Settling time | $A_{VD}$ = –1, 10-V step, $R_L$ = 1kΩ, $C_L$ = 100 pF | To 10 mV | 25°C | | 0.4 | | | 0.4 | | µs |
| | | | To 1 mV | | | 1.5 | | | 1.5 | | |
| $V_n$ | Equivalent input noise voltage | $R_S$ = 20 Ω, See Figure 3 | f = 10 Hz | 25°C | | 28 | | | 28 | | nV/√Hz |
| | | | f = 10 kHz | | | 11.6 | | | 11.6 | | |
| $V_{N(PP)}$ | Peak-to-peak equivalent input noise voltage | | f = 10 Hz to 10 kHz | 25°C | | 6 | | | 6 | | µV |
| | | | f = 0.1 Hz to 10 Hz | | | 0.6 | | | 0.6 | | |
| $I_n$ | Equivalent input noise current | $V_{IC}$ = 0, | f = 10 kHz | 25°C | | 2.8 | | | 2.8 | | fA/√Hz |
| THD + N | Total harmonic distortion plus noise | $V_{O(PP)}$ = 20 V, f = 1 kHz, $R_S$ = 25 Ω | $A_{VD}$ = 10, $R_L$ = 2 kΩ, | 25°C | | 0.008% | | | 0.008% | | |
| $B_1$ | Unity-gain bandwidth | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | 8* | 10 | | 8* | 10 | | MHz |
| $B_{OM}$ | Maximum output-swing bandwidth | $V_{O(PP)}$ = 20 V, $R_L$ = 2 kΩ, | $A_{VD}$ = –1, $C_L$ = 25 pF | 25°C | 478* | 637 | | 478* | 637 | | kHz |
| $\phi_m$ | Phase margin at unity gain | $V_I$ = 10 mV, $C_L$ = 25 pF, | $R_L$ = 2 kΩ, See Figure 2 | 25°C | | 57° | | | 57° | | |

*On products compliant with MIL-PRF-38535, Class B, this parameter is not production tested.
† Full range is –55°C to 125°C.

## TLE2084Y electrical characteristics at $V_{CC\pm}$ = ±15 V, $T_A$ = 25°C (unless otherwise noted)

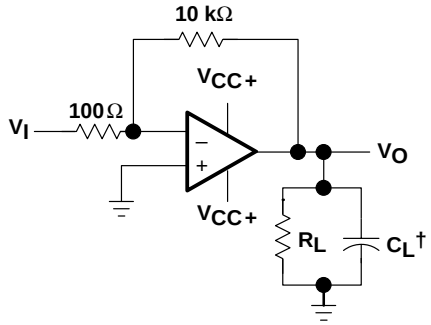
| PARAMETER | | TEST CONDITIONS | | TLE2084Y | | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{IC}$ = 0, $V_O$ = 0, $R_S$ = 50 Ω | | | | 7 | mV |
| $I_{IO}$ | Input offset current | $V_{IC}$ = 0, $V_O$ = 0, See Figure 4 | | | 15 | 100 | pA |
| $I_{IB}$ | Input bias current | | | | 25 | 175 | pA |
| $V_{ICR}$ | Common-mode input voltage range | $R_S$ = 50 Ω | | 15 to −11 | 15 to 11.9 | | V |
| $V_{OM+}$ | Maximum positive peak output voltage swing | $I_O$ = −200 μA | | 13.8 | 14.1 | | V |
| | | $I_O$ = −2 mA | | 13.5 | 13.9 | | |
| | | $I_O$ = −20 mA | | 11.5 | 12.3 | | |
| $V_{OM-}$ | Maximum negative peak output voltage swing | $I_O$ = 200 μA | | −13.8 | −14.2 | | V |
| | | $I_O$ = 2 mA | | −13.5 | −14 | | |
| | | $I_O$ = 20 mA | | −11.5 | −12.4 | | |
| $A_{VD}$ | Large-signal differential voltage amplification | $V_O$ = ± 10 V | $R_L$ = 600 Ω | 80 | 96 | | dB |
| | | | $R_L$ = 2 kΩ | 90 | 109 | | |
| | | | $R_L$ = 10 kΩ | 95 | 118 | | |
| $r_i$ | Input resistance | $V_{IC}$ = 0 | | | $10^{12}$ | | Ω |
| $c_i$ | Input capacitance | $V_{IC}$ = 0, See Figure 5 | Common mode | | 7.5 | | pF |
| | | | Differential | | 2.5 | | |
| $z_o$ | Open-loop output impedance | f = 1 MHz | | | 80 | | Ω |
| CMRR | Common-mode rejection ratio | $V_{IC}$ = $V_{ICR}$min, $V_O$ = 0, $R_S$ = 50 Ω | | 80 | 98 | | dB |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm}$ = ±5 V to ±15 V, $V_O$ = 0, $R_S$ = 50 Ω | | 82 | 99 | | dB |
| $I_{CC}$ | Supply current (four amplifiers) | $V_O$ = 0, | No load | 5.2 | 6.5 | 7.5 | mA |
| $I_{OS}$ | Short-circuit output current | $V_O$ = 0 | $V_{ID}$ = 1 V | −30 | −45 | | mA |
| | | | $V_{ID}$ = −1 V | 30 | 48 | | |

## PARAMETER MEASUREMENT INFORMATION




† Includes fixture capacitance

**Figure 1. Slew-Rate Test Circuit**




† Includes fixture capacitance

**Figure 2. Unity-Gain Bandwidth and Phase-Margin Test Circuit**

† Includes fixture capacitance

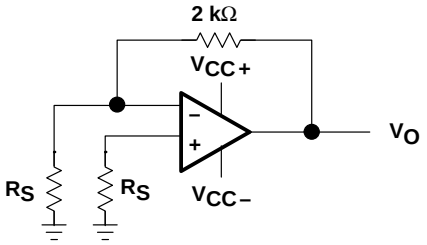



**Figure 3. Noise-Voltage Test Circuit**

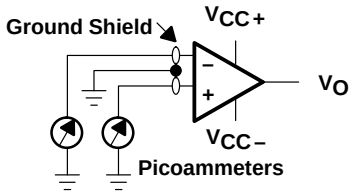



**Figure 4. Input-Bias and Offset-Current Test Circuit**

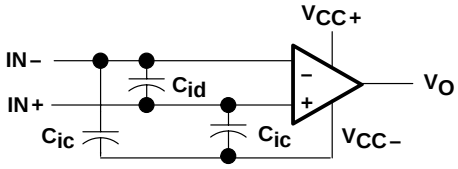



**Figure 5. Internal Input Capacitance**

### typical values

Typical values presented in this data sheet represent the median (50% point) of device parametric performance.

### input bias and offset current

At the picoampere bias-current level typical of the TLE208x and TLE208xA, accurate measurement of the bias becomes difficult. Not only does this measurement require a picoammeter, but test socket leakages can easily exceed the actual device bias currents. To accurately measure these small currents, Texas Instruments uses a two-step process. The socket leakage is measured using picoammeters with bias voltages applied but with no device in the socket. The device is then inserted in the socket and a second test is performed that measures both the socket leakage and the device input bias current. The two measurements are then subtracted algebraically to determine the bias current of the device.

## TYPICAL CHARACTERISTICS

### Table of Graphs

| | | | FIGURE |
|---|---|---|---|
| $V_{IO}$ | Input offset voltage | Distribution | 6, 7, 8 |
| $\alpha_{VIO}$ | Input offset voltage temperature coefficient | Distribution | 9, 10, 11 |
| $I_{IO}$ | Input offset current | vs Free-air temperature | 12 – 15 |
| $I_{IB}$ | Input bias current | vs Free-air temperature<br>vs Supply voltage | 12 – 15<br>16 |
| $V_{ICR}$ | Common-mode input voltage range | vs Free-air temperature | 17 |
| $V_{ID}$ | Differential input voltage | vs Output voltage | 18, 19 |
| $V_{OM+}$ | Maximum positive peak output voltage | vs Output current<br>vs Free-air temperature<br>vs Supply voltage | 20, 21<br>24, 25<br>26 |
| $V_{OM-}$ | Maximum negative peak output voltage | vs Output current<br>vs Free-air temperature<br>vs Supply voltage | 22, 23<br>24, 25<br>26 |
| $V_{O(PP)}$ | Maximum peak-to-peak output voltage | vs Frequency | 27 |
| $V_O$ | Output voltage | vs Settling time | 28 |
| $A_{VD}$ | Large-signal differential voltage amplification | vs Load resistance<br>vs Free-air temperature | 29<br>30, 31 |
| $A_{VD}$ | Small-signal differential voltage amplification | vs Frequency | 32, 33 |
| CMRR | Common-mode rejection ratio | vs Frequency<br>vs Free-air temperature | 34<br>35 |
| $k_{SVR}$ | Supply-voltage rejection ratio | vs Frequency<br>vs Free-air temperature | 36<br>37 |
| $I_{CC}$ | Supply current | vs Supply voltage<br>vs Free-air temperature<br>vs Differential input voltage | 38, 39, 40<br>41, 42, 43<br>44 – 49 |
| $I_{OS}$ | Short-circuit output current | vs Supply voltage<br>vs Elapsed time<br>vs Free-air temperature | 50<br>51<br>52 |
| SR | Slew rate | vs Free-air temperature<br>vs Load resistance<br>vs Differential input voltage | 53, 54<br>55<br>56 |
| $V_n$ | Equivalent input noise voltage | vs Frequency | 57 |
| $V_n$ | Input-referred noise voltage | vs Noise bandwidth frequency<br>Over a 10-second time interval | 58<br>59 |
| | Third-octave spectral noise density | vs Frequency bands | 60 |
| THD + N | Total harmonic distortion plus noise | vs Frequency | 61, 62 |
| $B_1$ | Unity-gain bandwidth | vs Load capacitance | 63 |
| | Gain-bandwidth product | vs Free-air temperature<br>vs Supply voltage | 64<br>65 |
| | Gain margin | vs Load capacitance | 66 |
| $\phi_m$ | Phase margin | vs Free-air temperature<br>vs Supply voltage<br>vs Load capacitance | 67<br>68<br>69 |
| | Phase shift | vs Frequency | 32, 33 |

## TYPICAL CHARACTERISTICS

### Table of Graphs (Continued)

| | | | FIGURE |
|---|---|---|---|
| | Noninverting large-signal pulse response | vs Time | 70 |
| | Small-signal pulse response | vs Time | 71 |
| $z_o$ | Closed-loop output impedance | vs Frequency | 72 |
| $a_X$ | Crosstalk attenuation | vs Frequency | 73 |

**DISTRIBUTION OF TLE2081**
**INPUT OFFSET VOLTAGE**

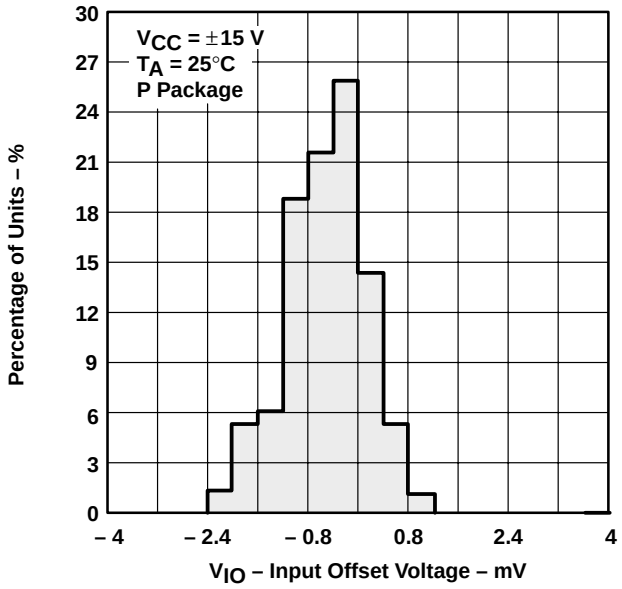



Figure 6

**DISTRIBUTION OF TLE2082**
**INPUT OFFSET VOLTAGE**

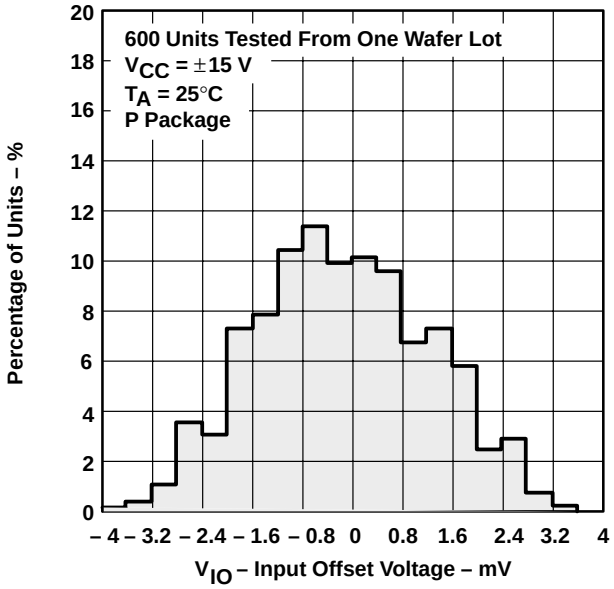



Figure 7

## TYPICAL CHARACTERISTICS

**DISTRIBUTION OF TLE2084 INPUT OFFSET VOLTAGE**

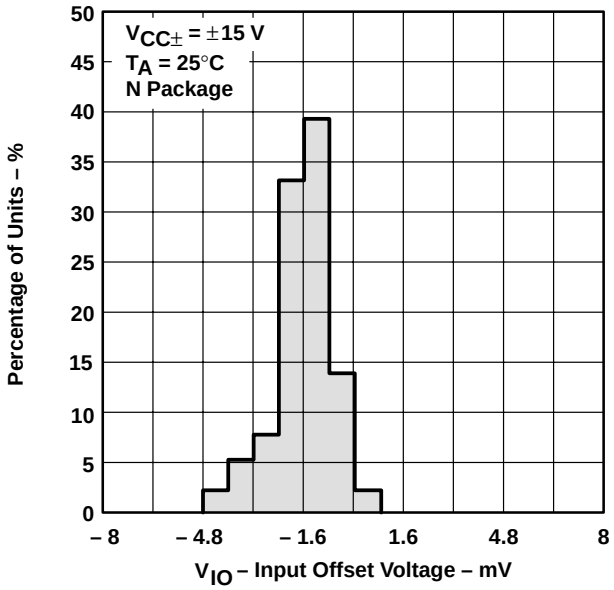



**Figure 8**

**DISTRIBUTION OF TLE2081 INPUT OFFSET VOLTAGE TEMPERATURE COEFFICIENT**

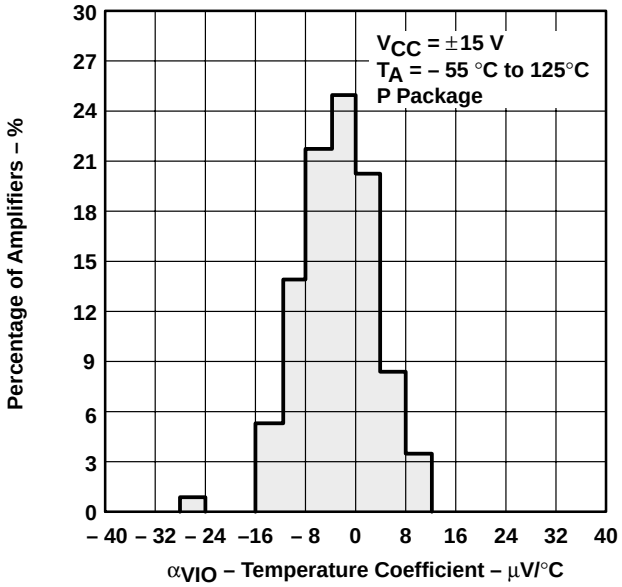



**Figure 9**

**DISTRIBUTION OF TLE2082 INPUT OFFSET VOLTAGE TEMPERATURE COEFFICIENT**

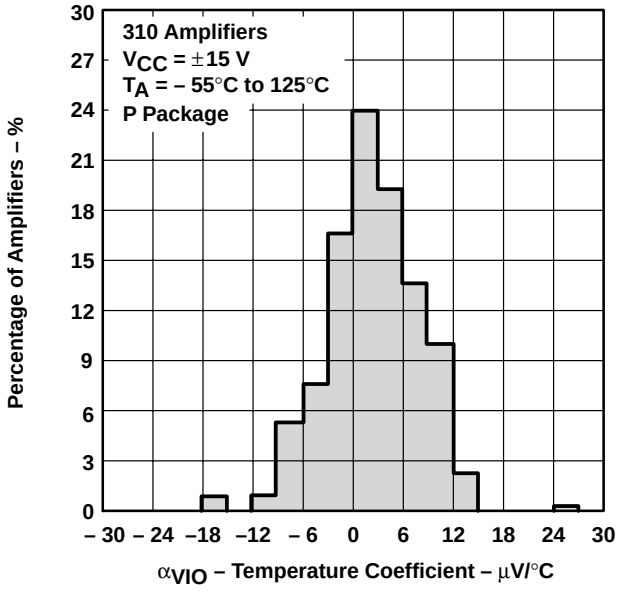



**Figure 10**

**DISTRIBUTION OF TLE2084 INPUT OFFSET VOLTAGE TEMPERATURE COEFFICIENT**

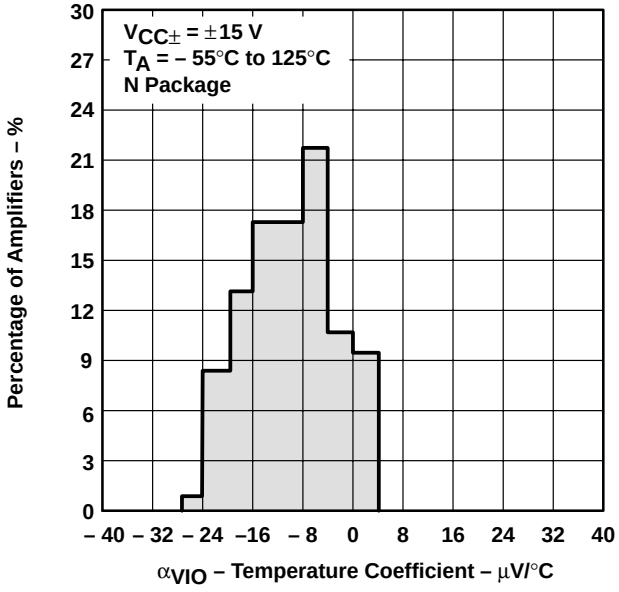



**Figure 11**

## TYPICAL CHARACTERISTICS†

**TLE2081 AND TLE2082**
**INPUT BIAS CURRENT AND INPUT OFFSET CURRENT**
**vs**
**FREE-AIR TEMPERATURE**

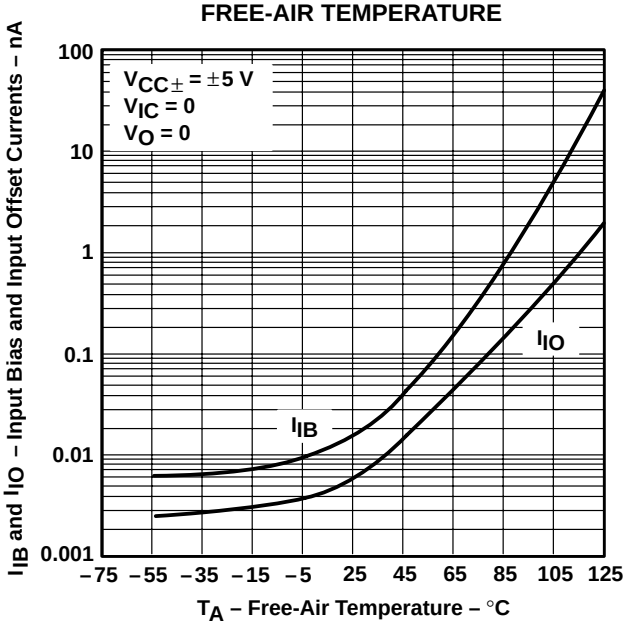



Figure 12

**TLE2084**
**INPUT BIAS CURRENT AND INPUT OFFSET CURRENT**
**vs**
**FREE-AIR TEMPERATURE**

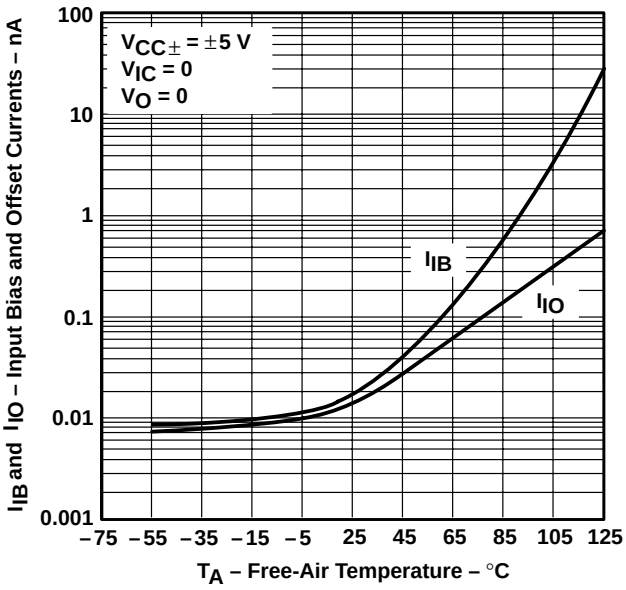



Figure 13

**TLE2081 AND TLE2082**
**INPUT BIAS CURRENT AND INPUT OFFSET CURRENT**
**vs**
**FREE-AIR TEMPERATURE**

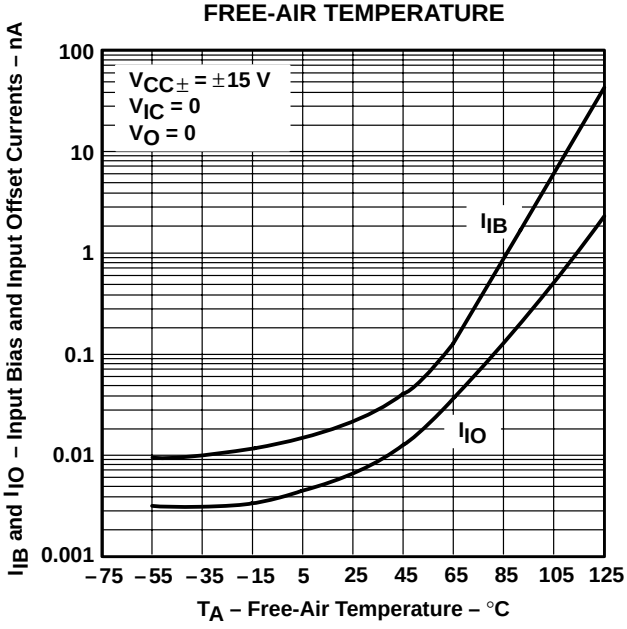



Figure 14

**TLE2084**
**INPUT BIAS CURRENT AND INPUT OFFSET CURRENT**
**vs**
**FREE-AIR TEMPERATURE**

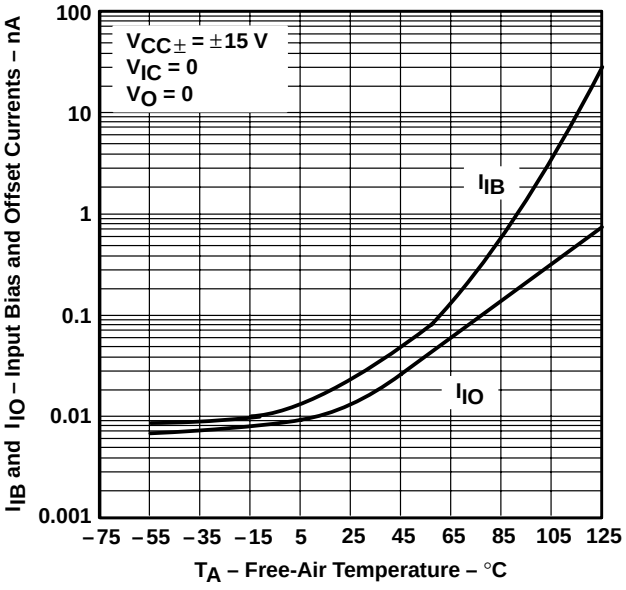



Figure 15

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

## TYPICAL CHARACTERISTICS†

**INPUT BIAS CURRENT vs TOTAL SUPPLY VOLTAGE**

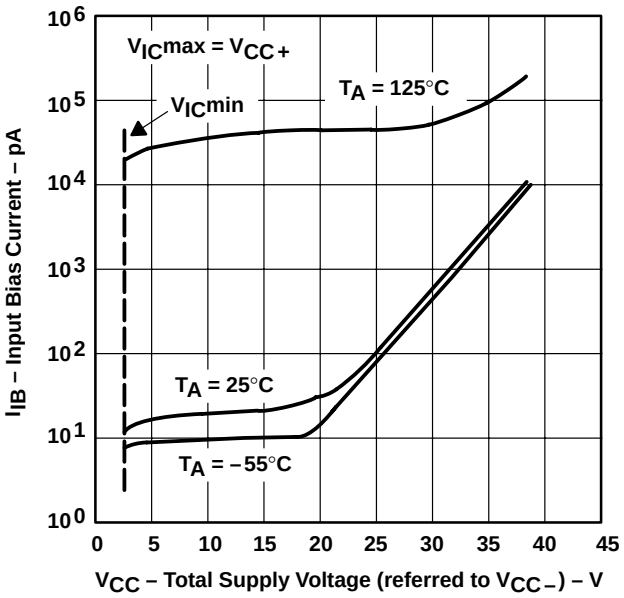



Figure 16

**COMMON-MODE INPUT VOLTAGE RANGE vs FREE-AIR TEMPERATURE**

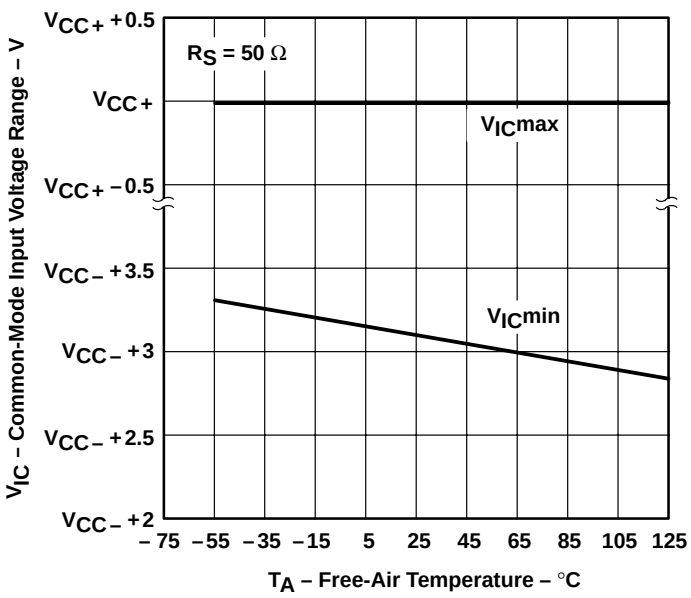



Figure 17

**DIFFERENTIAL INPUT VOLTAGE vs OUTPUT VOLTAGE**

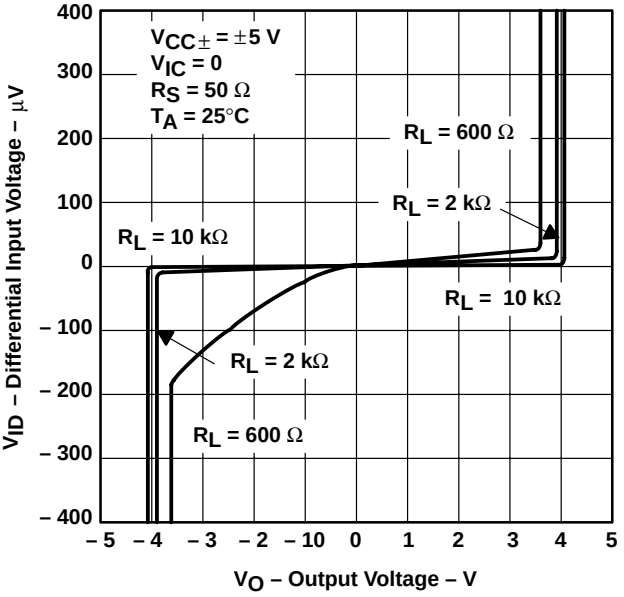



Figure 18

**DIFFERENTIAL INPUT VOLTAGE vs OUTPUT VOLTAGE**

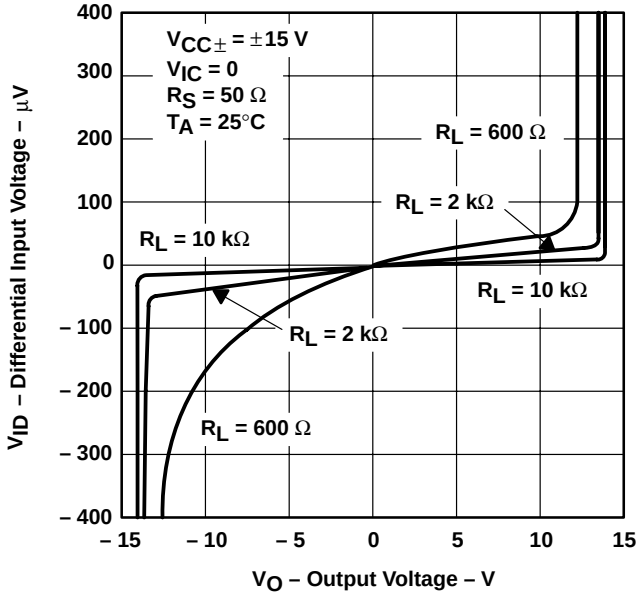



Figure 19

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

## TYPICAL CHARACTERISTICS†

**TLE2081 AND TLE2082
MAXIMUM POSITIVE PEAK OUTPUT VOLTAGE
vs
OUTPUT CURRENT**

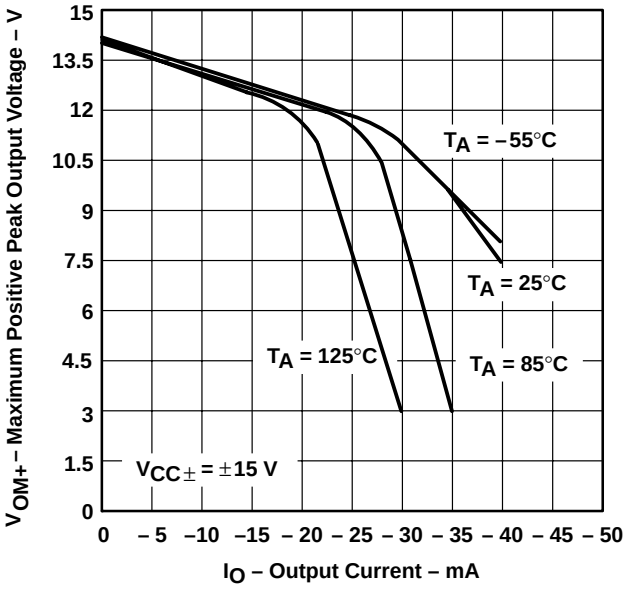



**Figure 20**

**TLE2084
MAXIMUM POSITIVE PEAK OUTPUT VOLTAGE
vs
OUTPUT CURRENT**

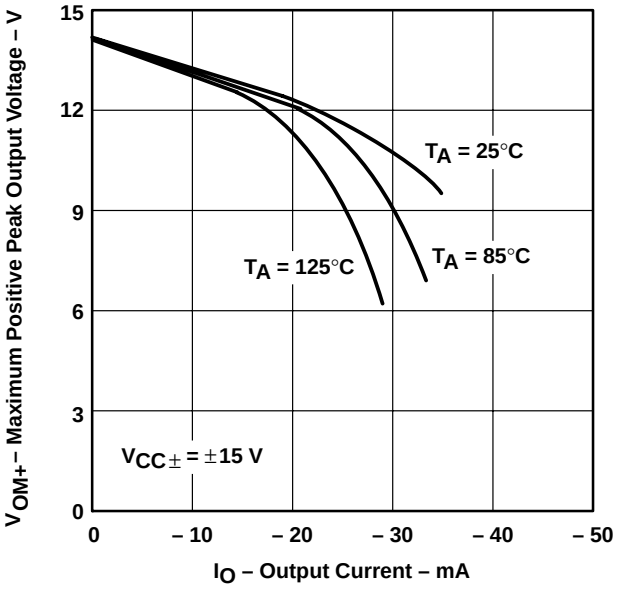



**Figure 21**

**TLE2081 AND TLE2082
MAXIMUM NEGATIVE PEAK OUTPUT VOLTAGE
vs
OUTPUT CURRENT**

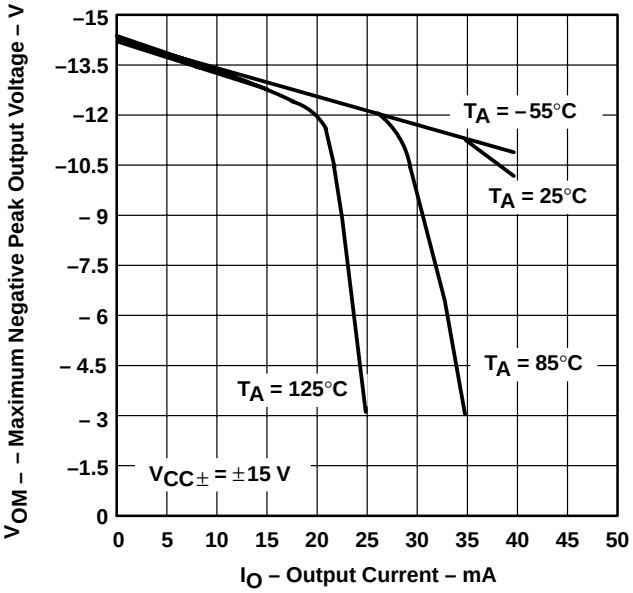



**Figure 22**

**TLE2084
MAXIMUM NEGATIVE PEAK OUTPUT VOLTAGE
vs
OUTPUT CURRENT**

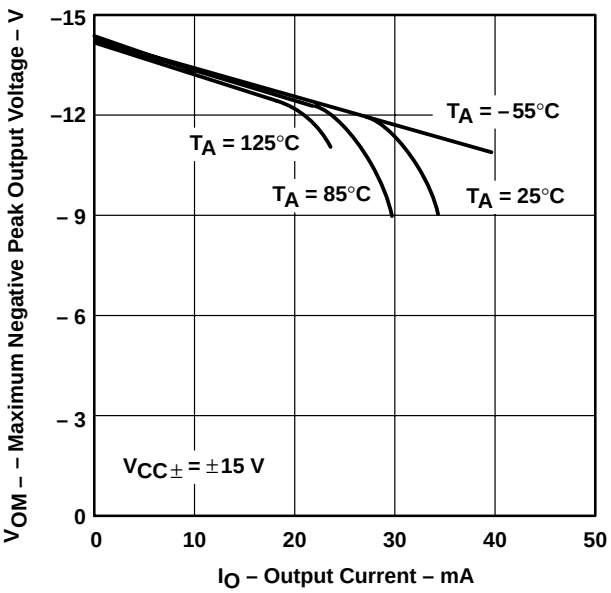



**Figure 23**

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

## TYPICAL CHARACTERISTICS†

**MAXIMUM PEAK OUTPUT VOLTAGE vs FREE-AIR TEMPERATURE**

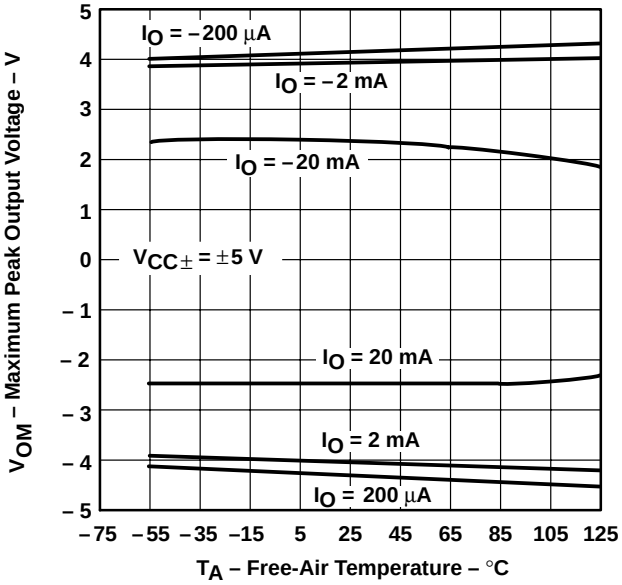



**Figure 24**

**MAXIMUM PEAK OUTPUT VOLTAGE vs FREE-AIR TEMPERATURE**

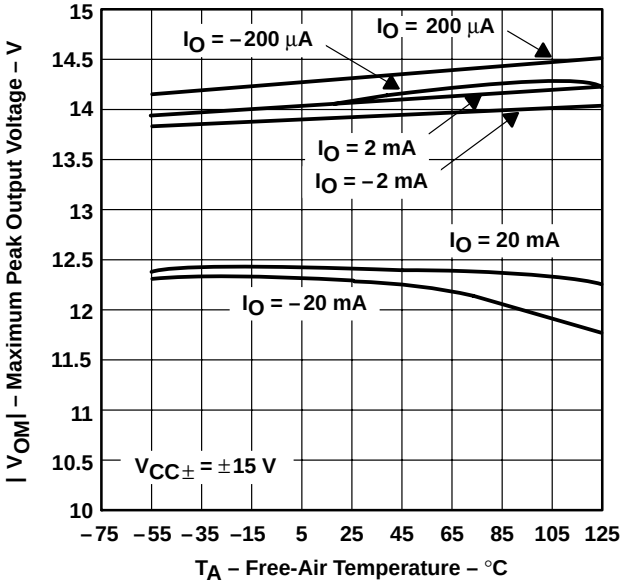



**Figure 25**

**MAXIMUM PEAK OUTPUT VOLTAGE vs SUPPLY VOLTAGE**

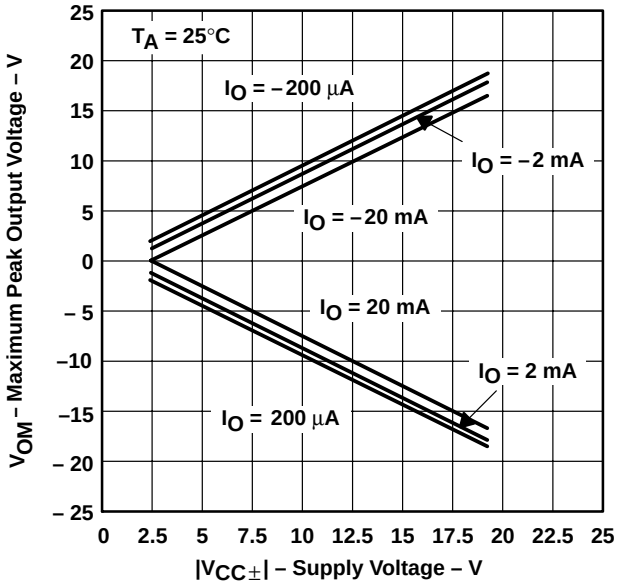



**Figure 26**

**MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE vs FREQUENCY**

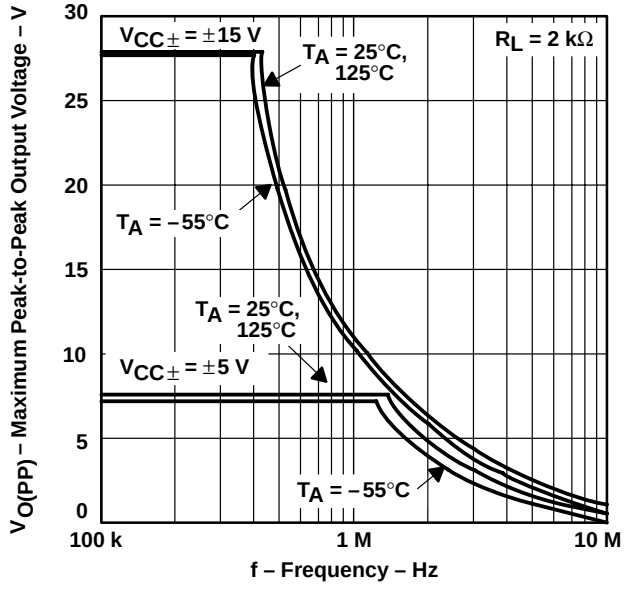



**Figure 27**

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

## TYPICAL CHARACTERISTICS†

**OUTPUT VOLTAGE vs SETTLING TIME**

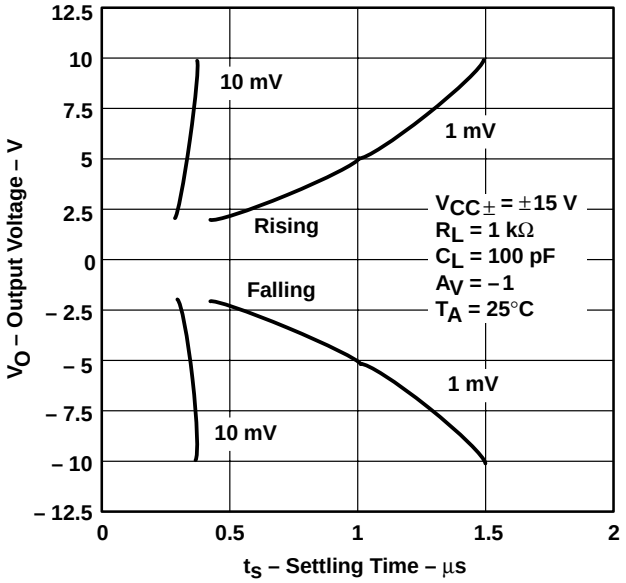



**Figure 28**

**LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION vs LOAD RESISTANCE**

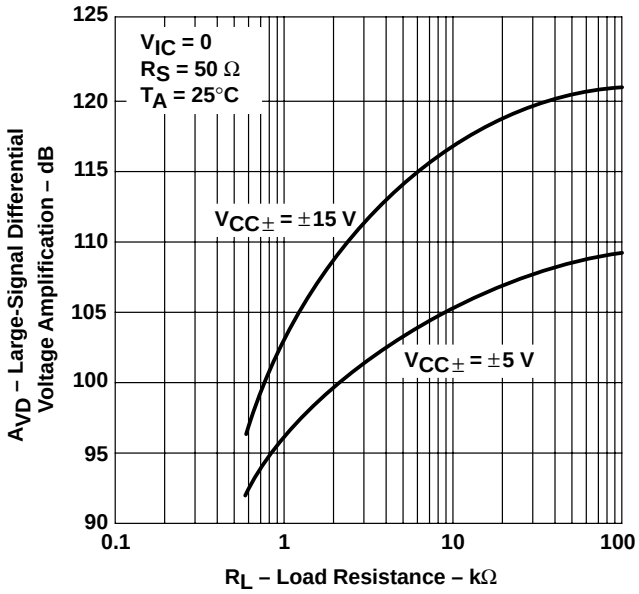



**Figure 29**

**LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION vs FREE-AIR TEMPERATURE**

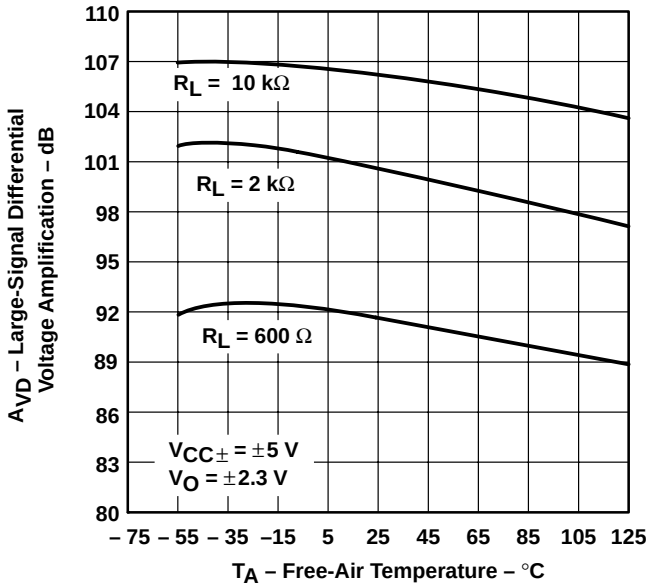



**Figure 30**

**LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION vs FREE-AIR TEMPERATURE**

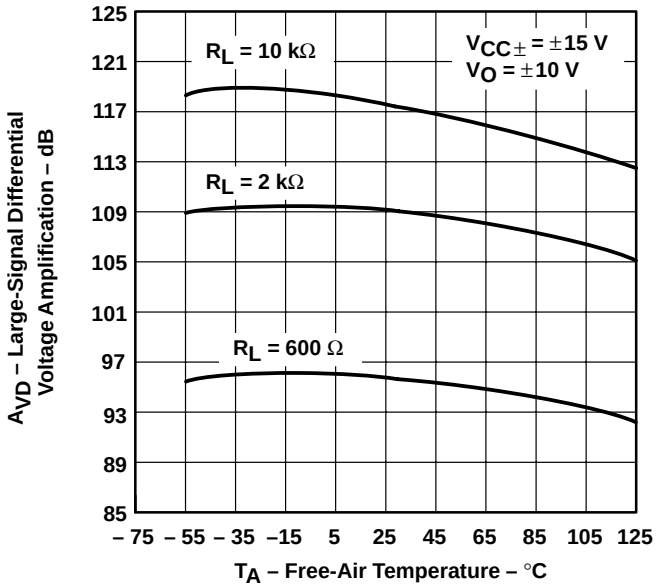



**Figure 31**

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

## TYPICAL CHARACTERISTICS

**SMALL-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT vs FREQUENCY**

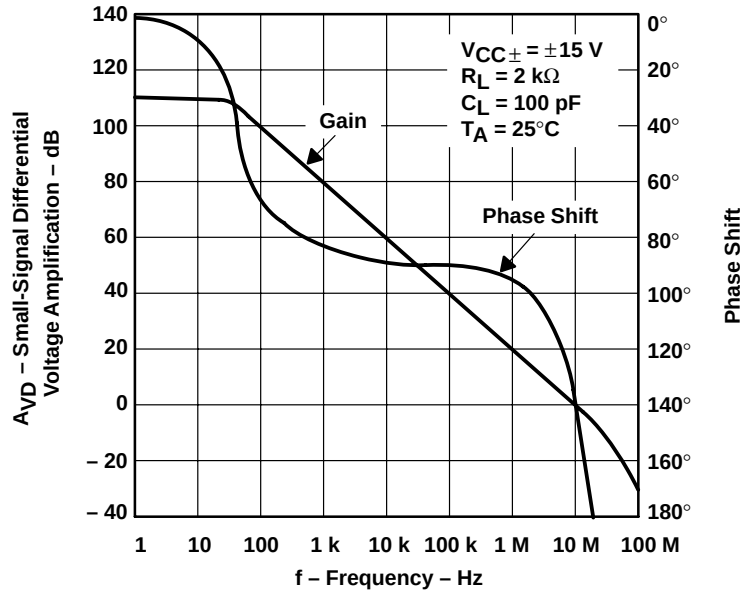



**Figure 32**

**SMALL-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT vs FREQUENCY**

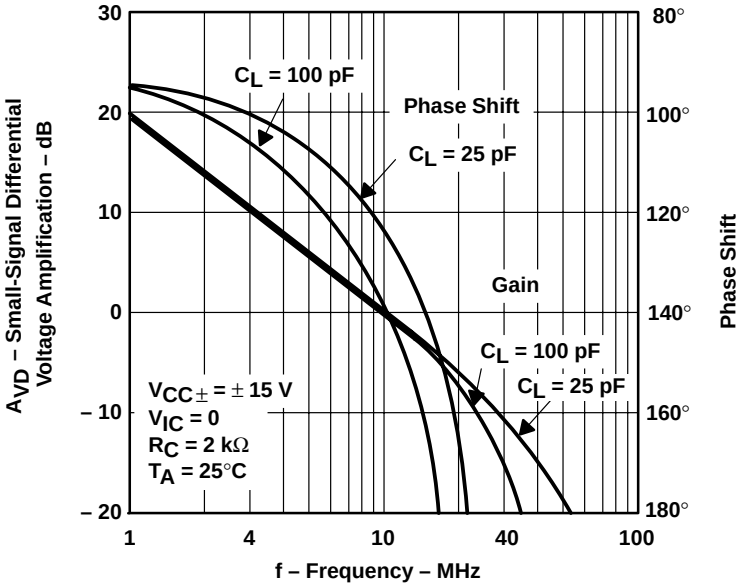



**Figure 33**

## TYPICAL CHARACTERISTICS†

**COMMON-MODE REJECTION RATIO vs FREQUENCY**

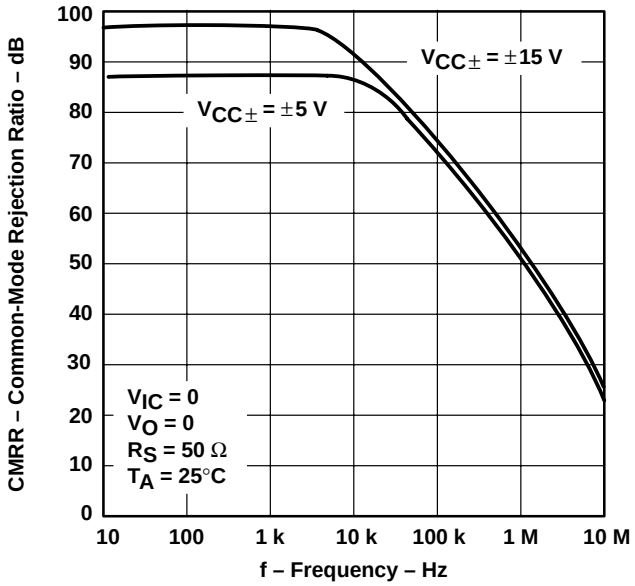



Figure 34

**COMMON-MODE REJECTION RATIO vs FREE-AIR TEMPERATURE**

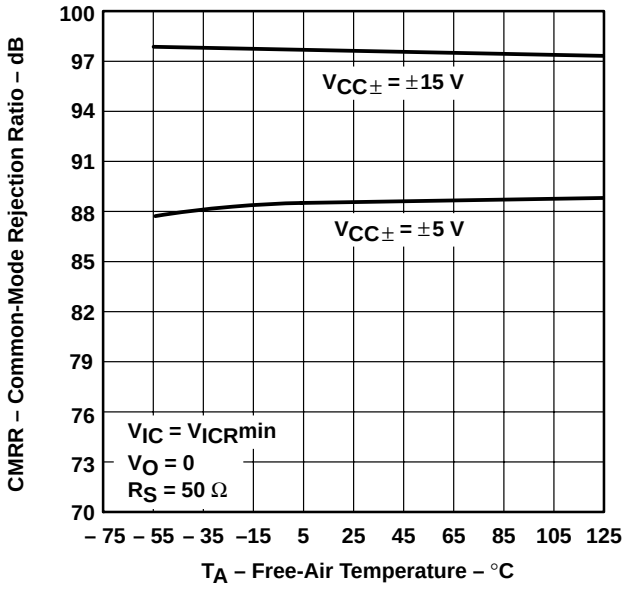



Figure 35

**SUPPLY-VOLTAGE REJECTION RATIO vs FREQUENCY**

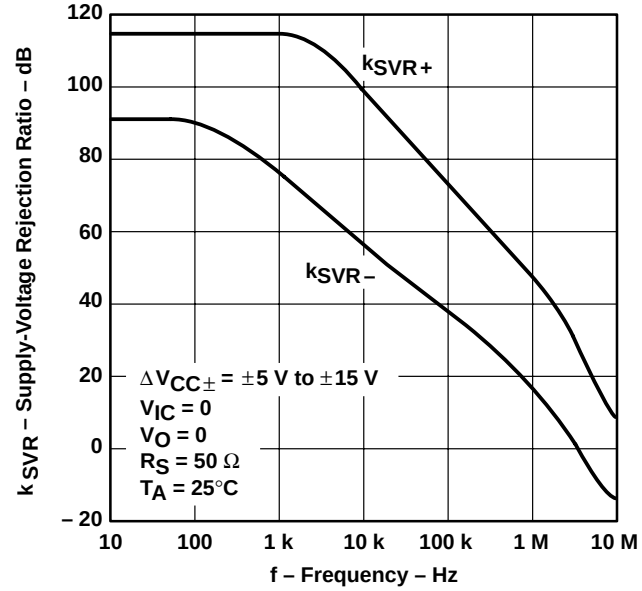



Figure 36

**SUPPLY-VOLTAGE REJECTION RATIO vs FREE-AIR TEMPERATURE**

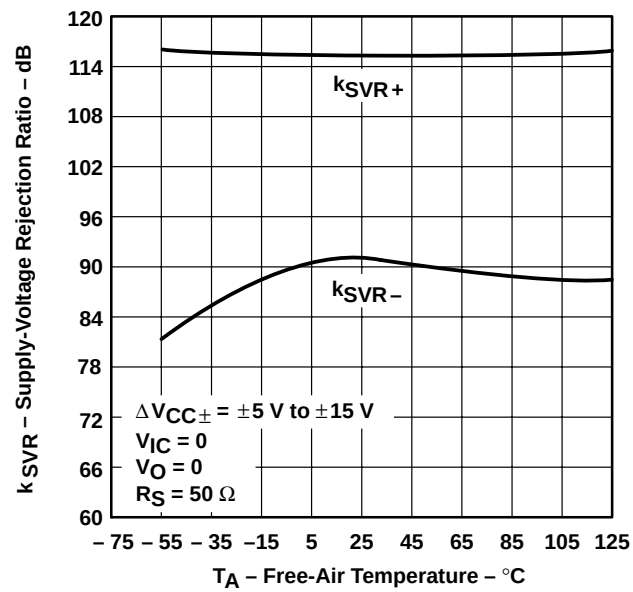



Figure 37

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

## TYPICAL CHARACTERISTICS†

TLE2081
SUPPLY CURRENT
vs
SUPPLY VOLTAGE

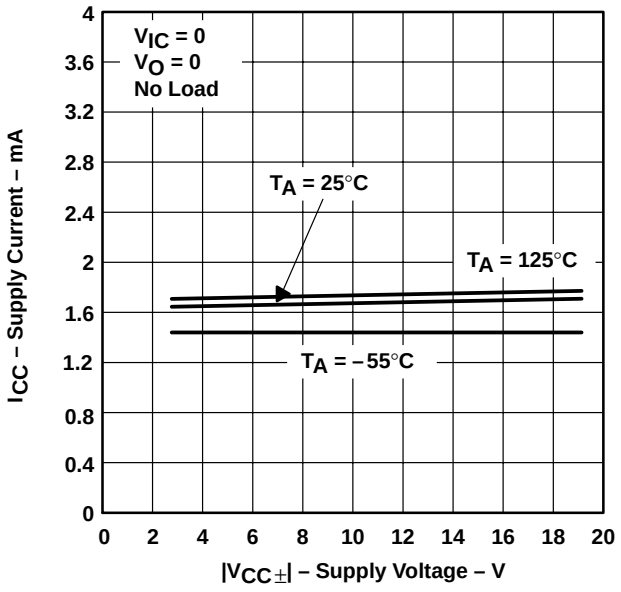



Figure 38

TLE2082
SUPPLY CURRENT
vs
SUPPLY VOLTAGE

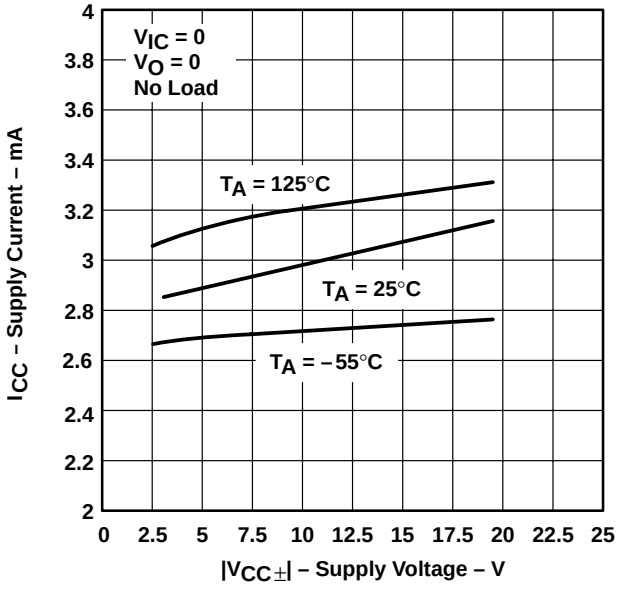



Figure 39

TLE2084
SUPPLY CURRENT
vs
SUPPLY VOLTAGE

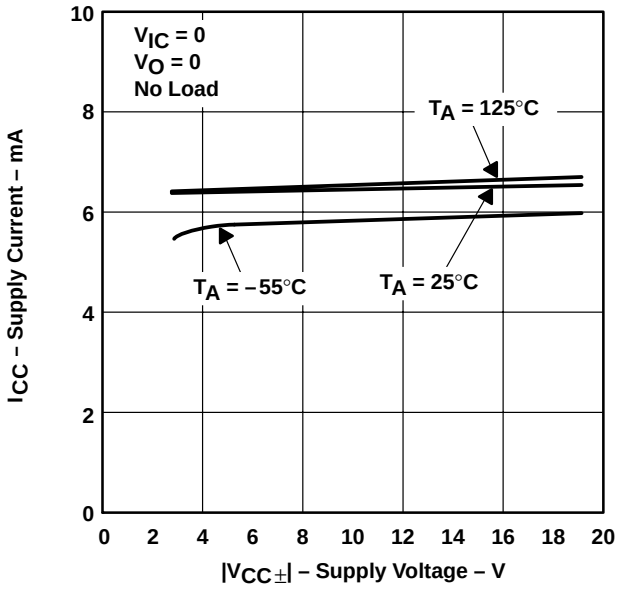



Figure 40

TLE2081
SUPPLY CURRENT
vs
FREE-AIR TEMPERATURE

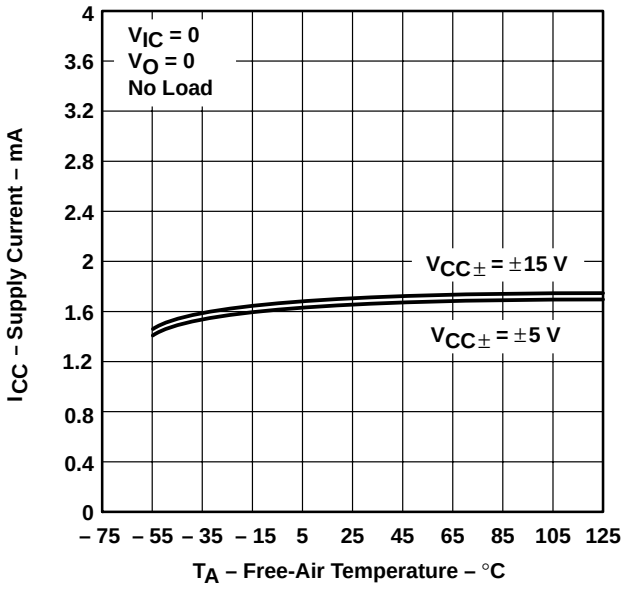



Figure 41

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

## TYPICAL CHARACTERISTICS†

**TLE2082**
**SUPPLY CURRENT**
**vs**
**FREE-AIR TEMPERATURE**

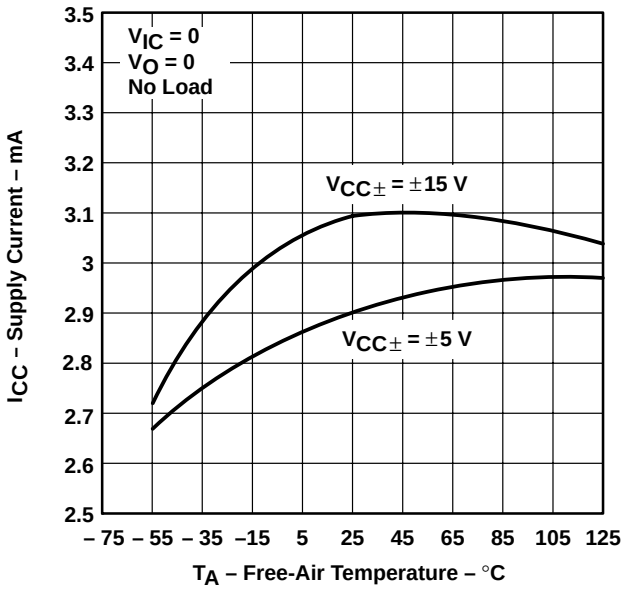



**Figure 42**

**TLE2084**
**SUPPLY CURRENT**
**vs**
**FREE-AIR TEMPERATURE**

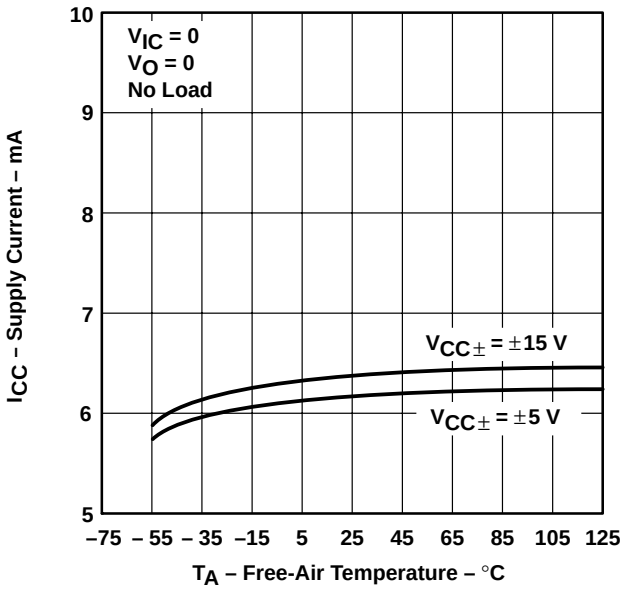



**Figure 43**

**TLE2081**
**SUPPLY CURRENT**
**vs**
**DIFFERENTIAL INPUT VOLTAGE**

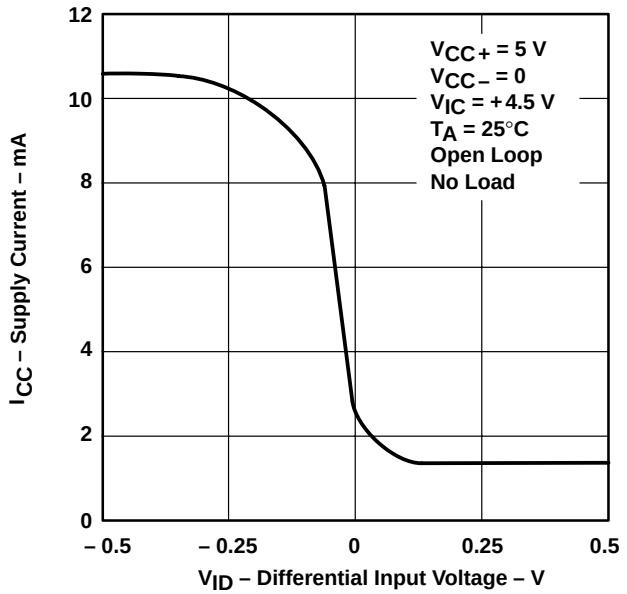



**Figure 44**

**TLE2082**
**SUPPLY CURRENT**
**vs**
**DIFFERENTIAL INPUT VOLTAGE**

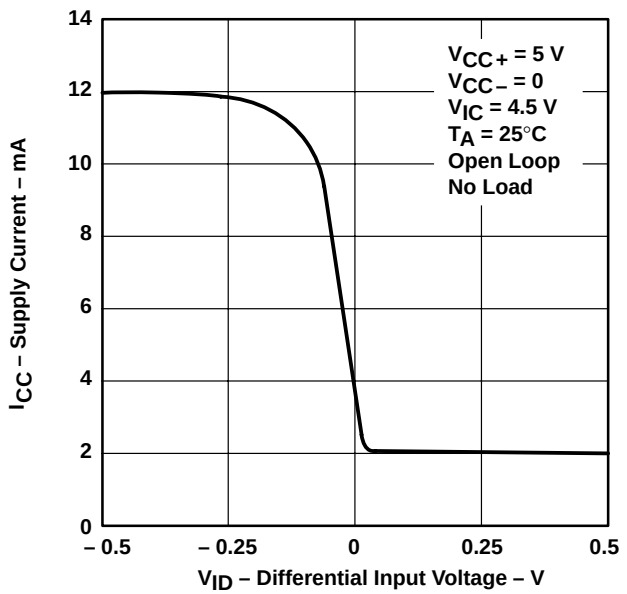



**Figure 45**

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

## TYPICAL CHARACTERISTICS

**TLE2084
SUPPLY CURRENT
vs
DIFFERENTIAL INPUT VOLTAGE**

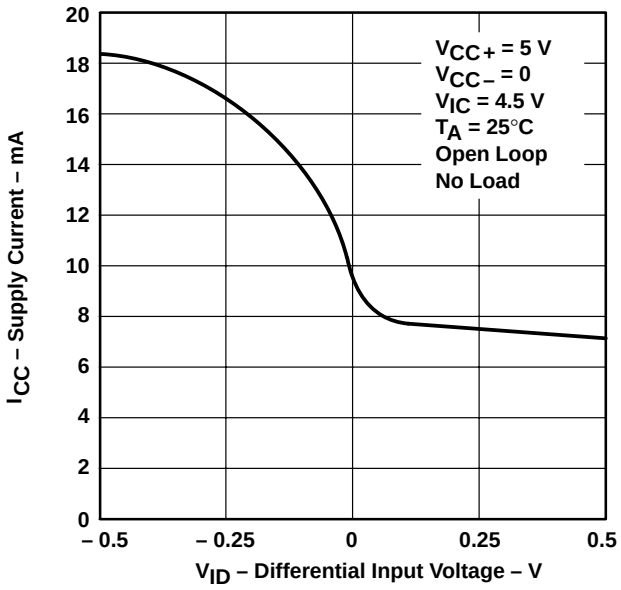



**Figure 46**

**TLE2081
SUPPLY CURRENT
vs
DIFFERENTIAL INPUT VOLTAGE**

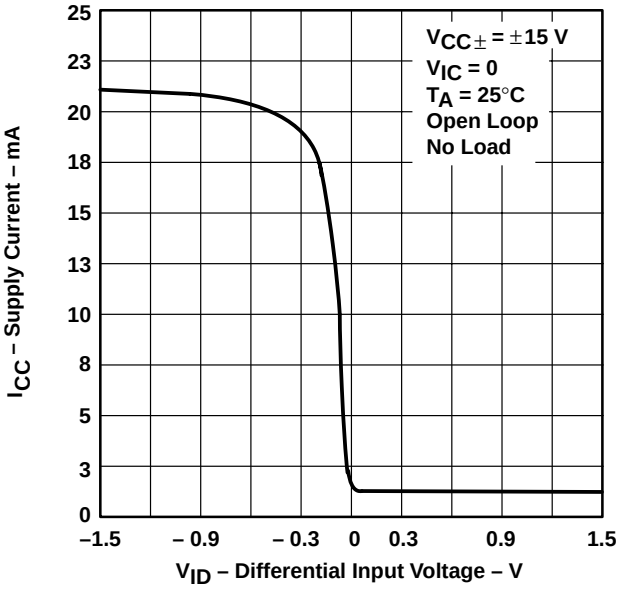



**Figure 47**

**TLE2082
SUPPLY CURRENT
vs
DIFFERENTIAL INPUT VOLTAGE**

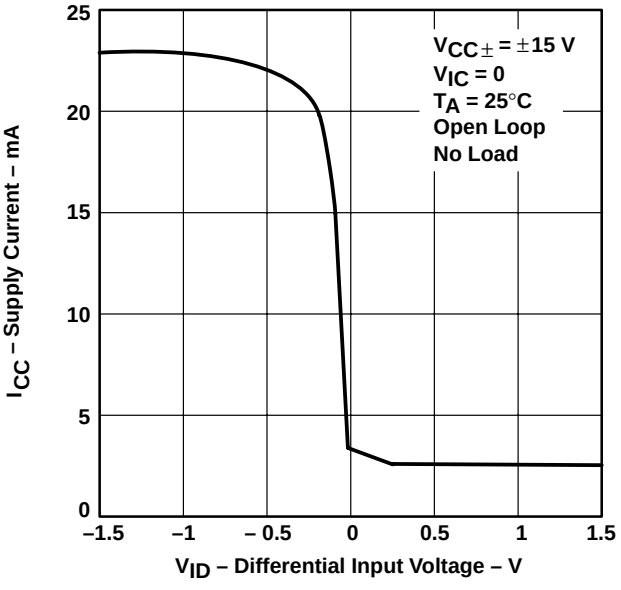



**Figure 48**

**TLE2084
SUPPLY CURRENT
vs
DIFFERENTIAL INPUT VOLTAGE**

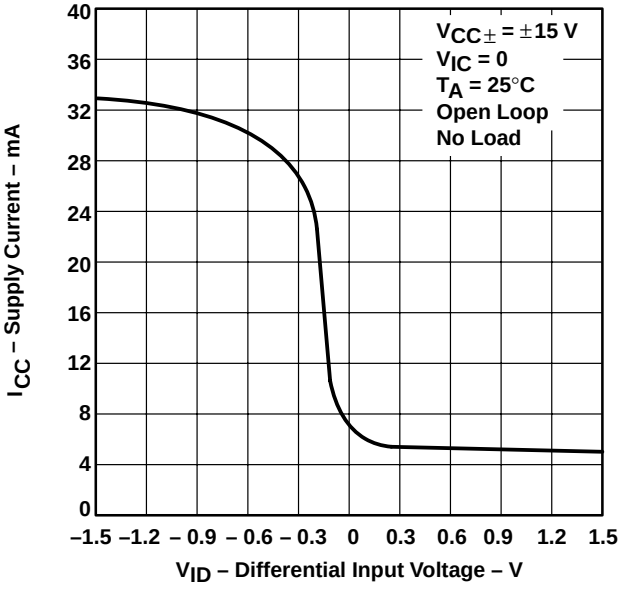



**Figure 49**

## TYPICAL CHARACTERISTICS†

**SHORT-CIRCUIT OUTPUT CURRENT vs SUPPLY VOLTAGE**

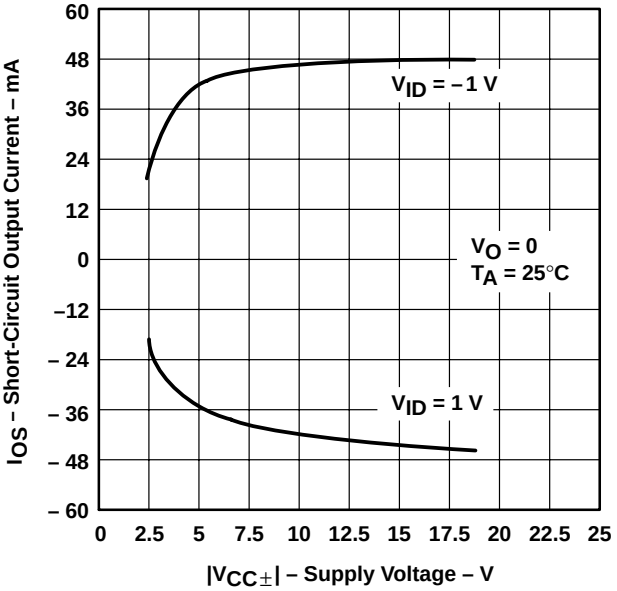



Figure 50

**SHORT-CIRCUIT OUTPUT CURRENT vs ELAPSED TIME**

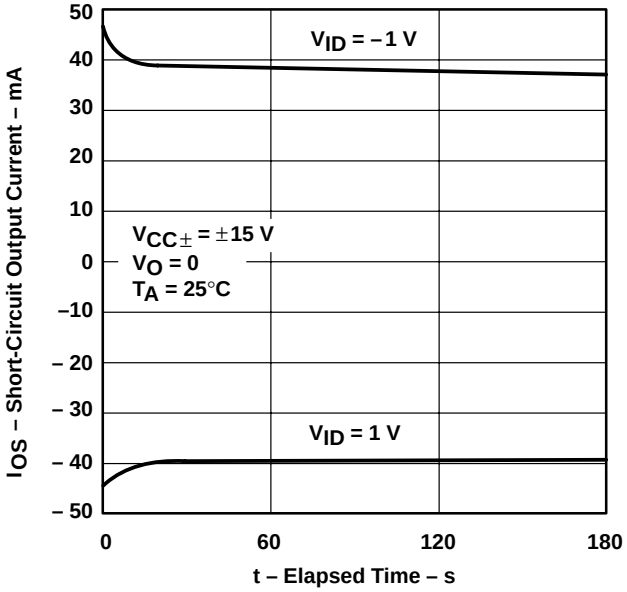



Figure 51

**SHORT-CIRCUIT OUTPUT CURRENT vs FREE-AIR TEMPERATURE**

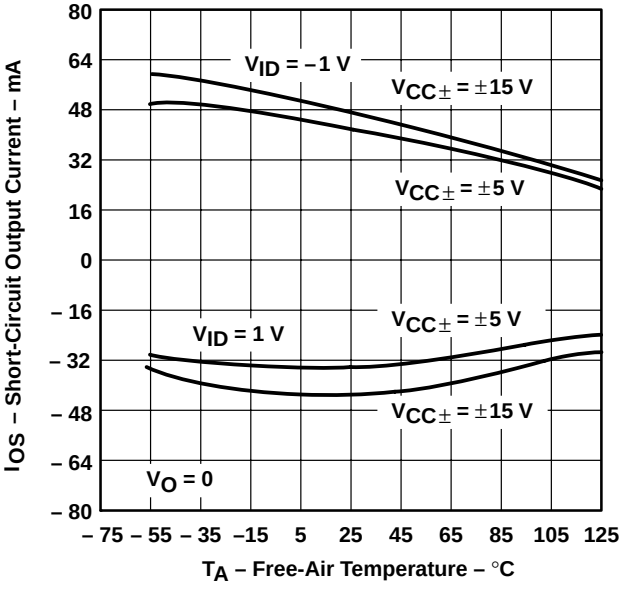



Figure 52

**SLEW RATE vs FREE-AIR TEMPERATURE**

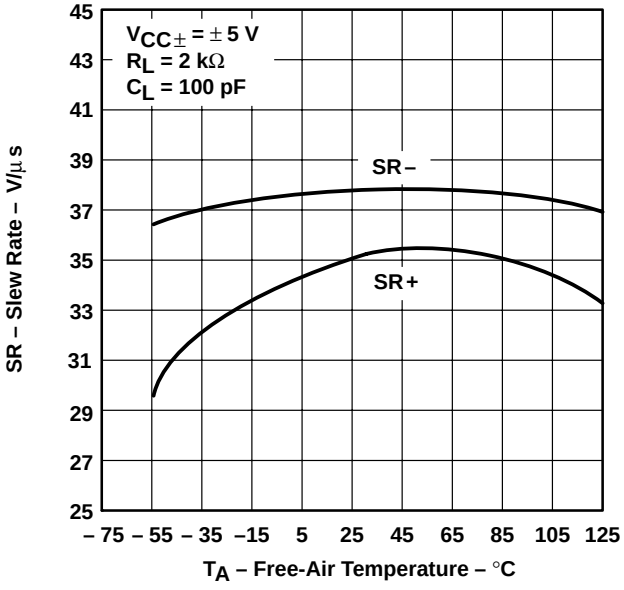



Figure 53

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

## TYPICAL CHARACTERISTICS†

**SLEW RATE vs FREE-AIR TEMPERATURE**

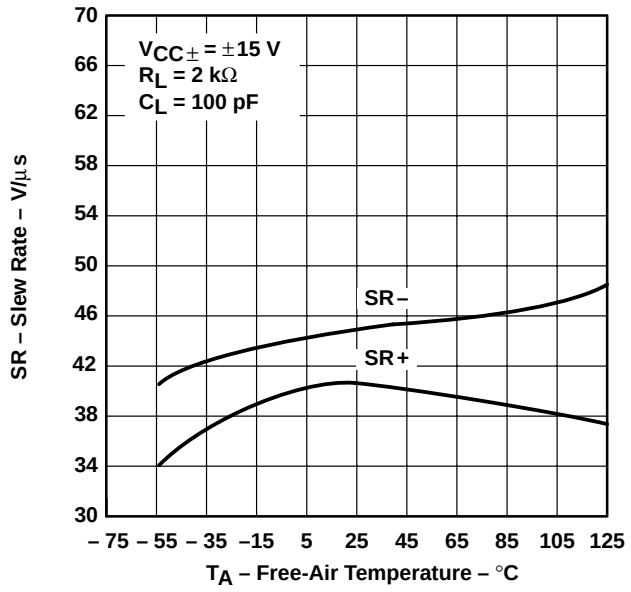



**Figure 54**

**SLEW RATE vs LOAD RESISTANCE**

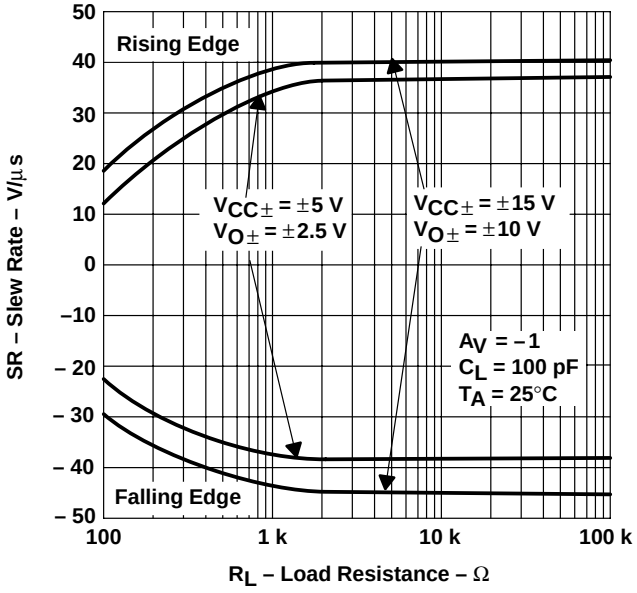



**Figure 55**

**SLEW RATE vs DIFFERENTIAL INPUT VOLTAGE**

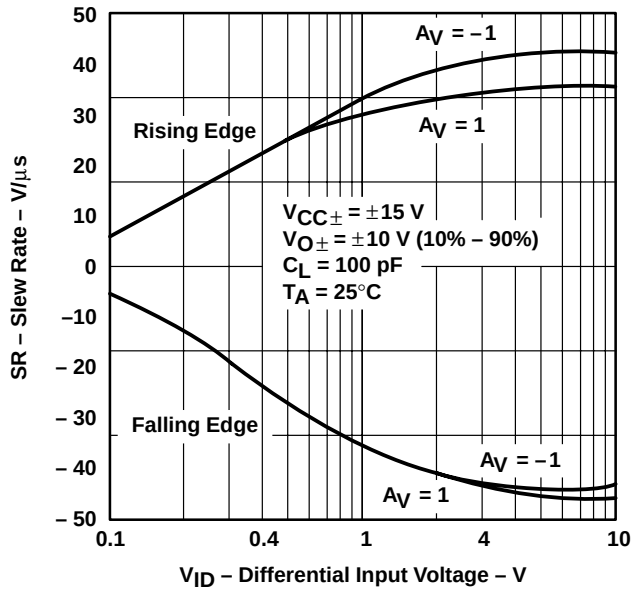



**Figure 56**

**EQUIVALENT INPUT NOISE VOLTAGE vs FREQUENCY**

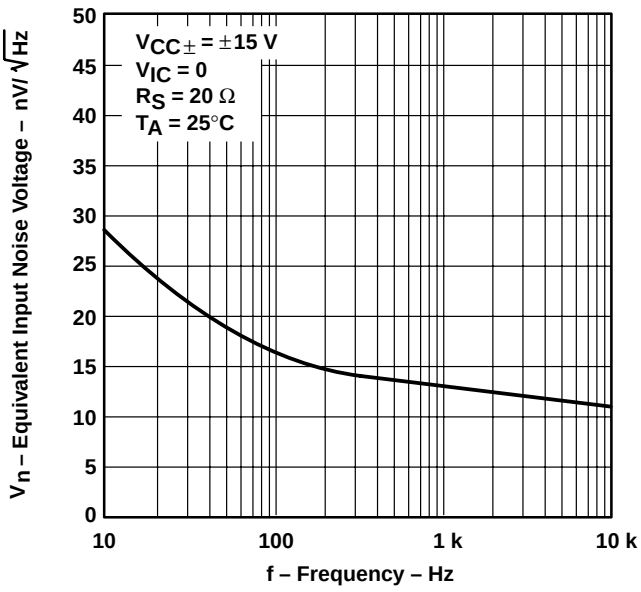



**Figure 57**

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

## TYPICAL CHARACTERISTICS

**INPUT-REFERRED NOISE VOLTAGE vs NOISE BANDWIDTH FREQUENCY**

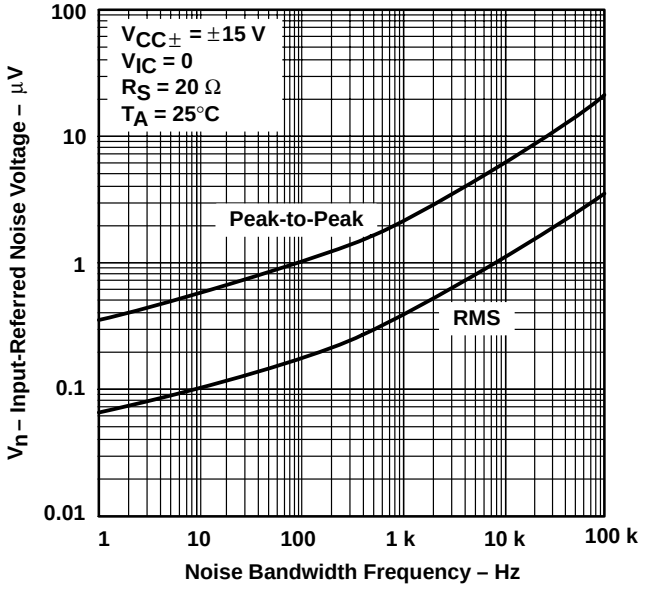



Figure 58

**INPUT-REFERRED NOISE VOLTAGE OVER A 10-SECOND TIME INTERVAL**

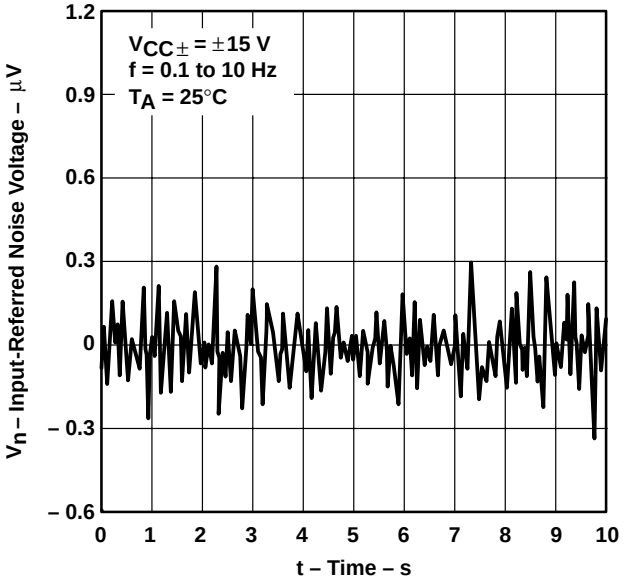



Figure 59

**THIRD-OCTAVE SPECTRAL NOISE DENSITY vs FREQUENCY BANDS**

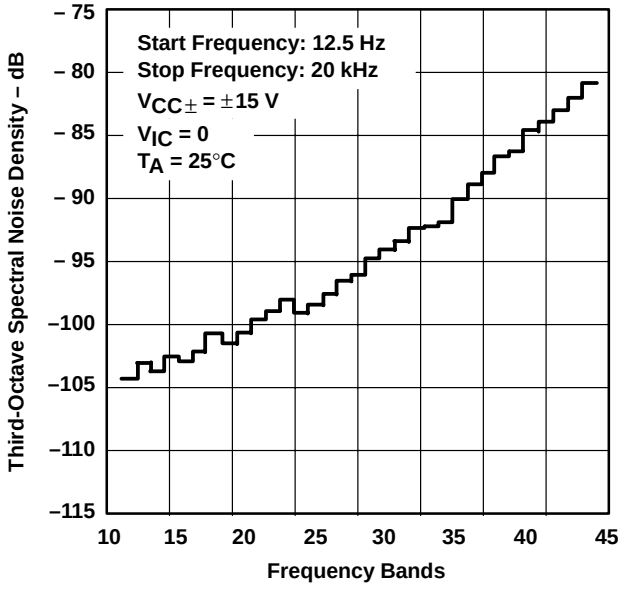



Figure 60

**TOTAL HARMONIC DISTORTION PLUS NOISE vs FREQUENCY**

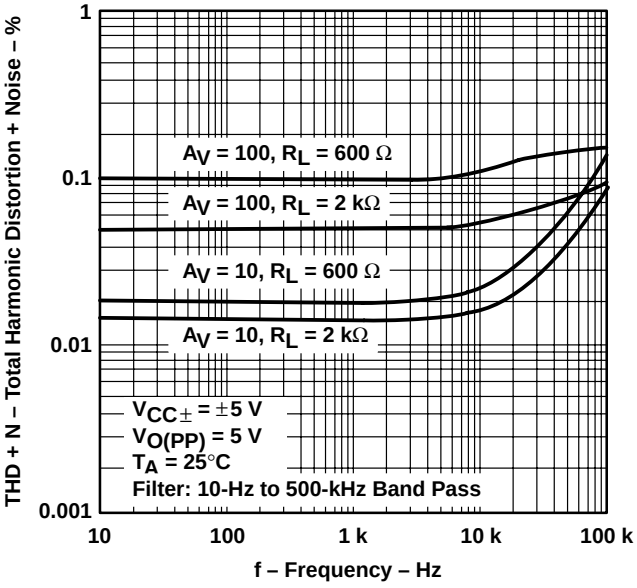



Figure 61

## TYPICAL CHARACTERISTICS†

**TOTAL HARMONIC DISTORTION PLUS NOISE vs FREQUENCY**

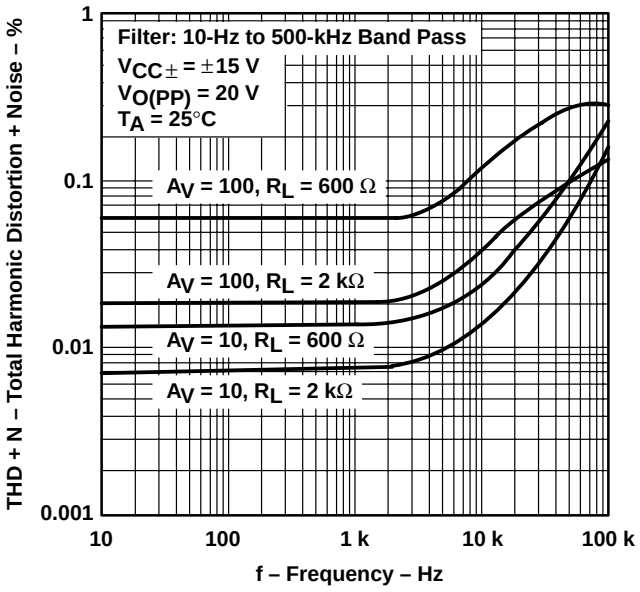



Figure 62

**UNITY-GAIN BANDWIDTH vs LOAD CAPACITANCE**

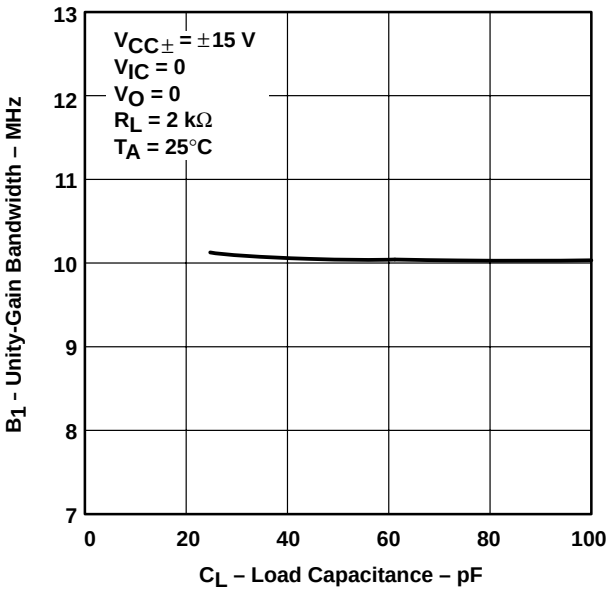



Figure 63

**GAIN-BANDWIDTH PRODUCT vs FREE-AIR TEMPERATURE**

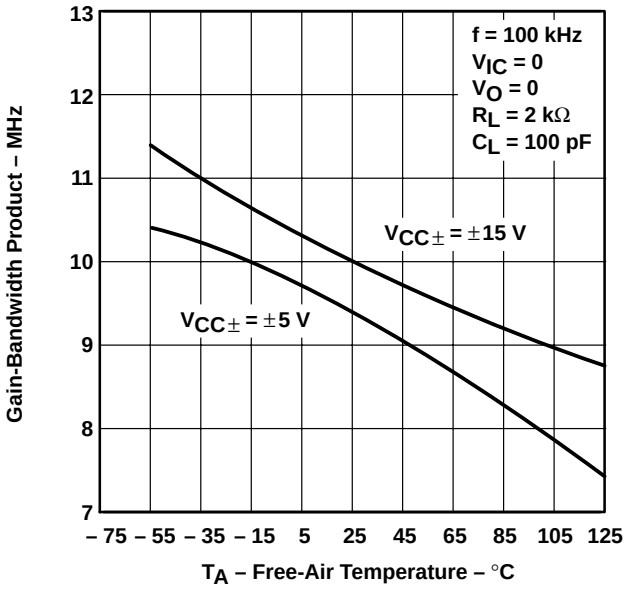



Figure 64

**GAIN-BANDWIDTH PRODUCT vs SUPPLY VOLTAGE**

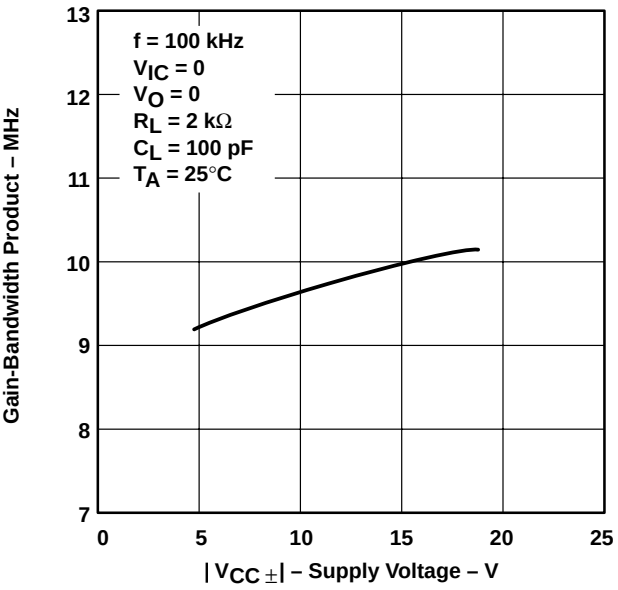



Figure 65

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

## TYPICAL CHARACTERISTICS†

**GAIN MARGIN vs LOAD CAPACITANCE**

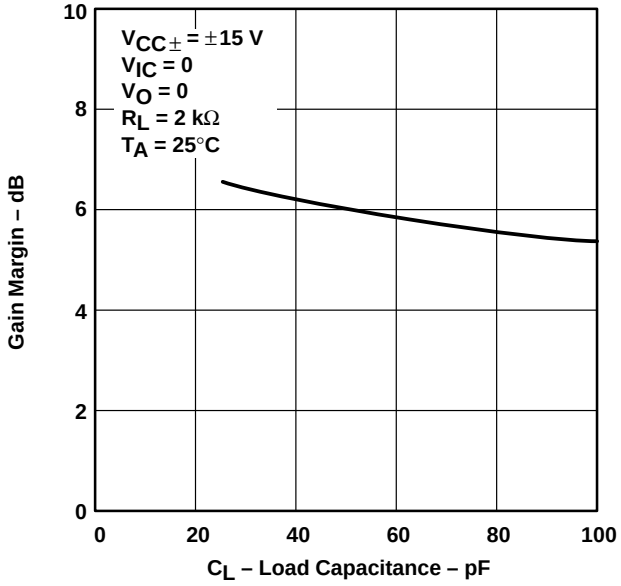



Figure 66

**PHASE MARGIN vs FREE-AIR TEMPERATURE**

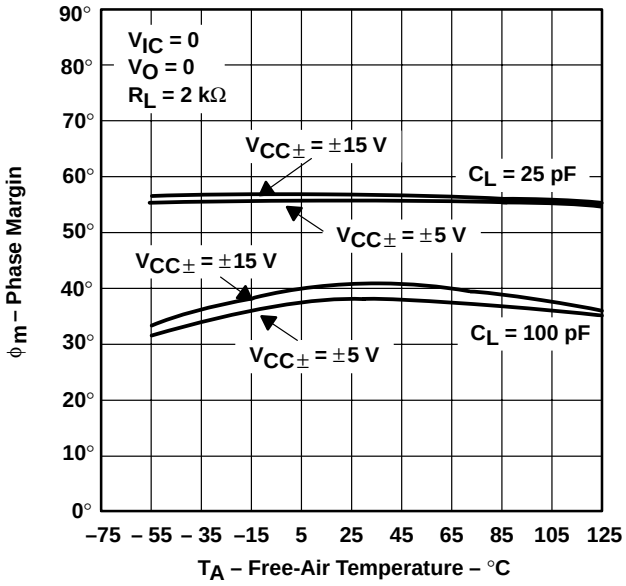



Figure 67

**PHASE MARGIN vs SUPPLY VOLTAGE**

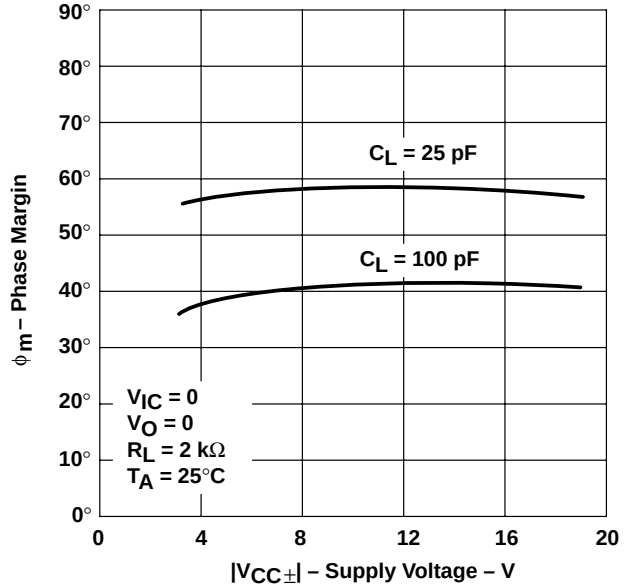



Figure 68

**PHASE MARGIN vs LOAD CAPACITANCE**

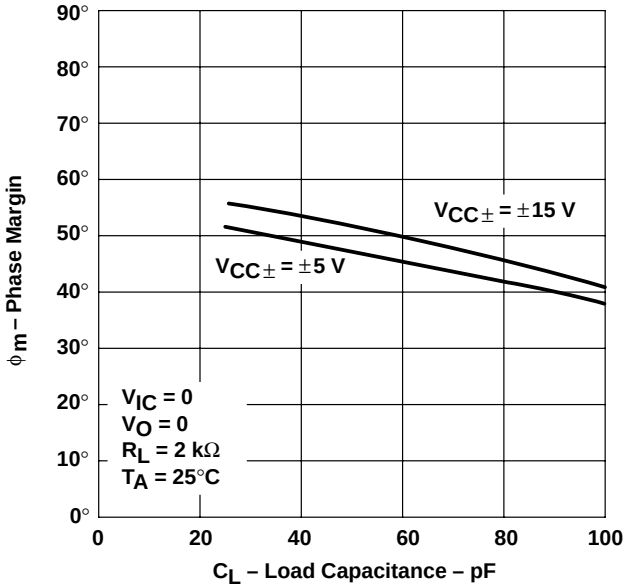



Figure 69

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

## TYPICAL CHARACTERISTICS†

**NONINVERTING LARGE-SIGNAL PULSE RESPONSE**

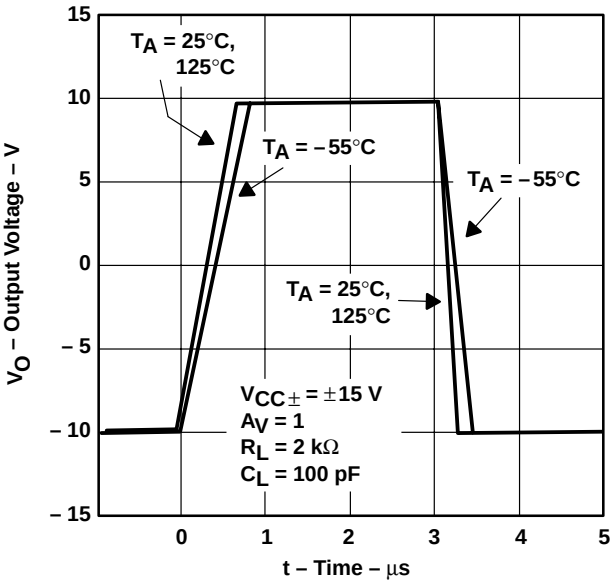



**Figure 70**

**SMALL-SIGNAL PULSE RESPONSE**

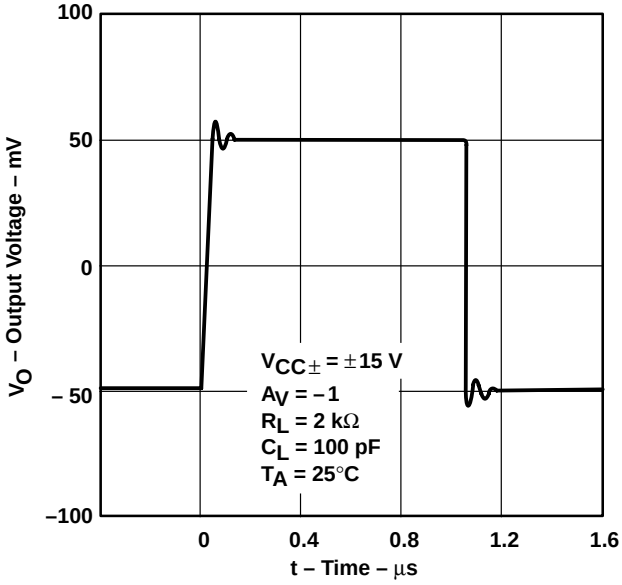



**Figure 71**

**CLOSED-LOOP OUTPUT IMPEDANCE vs FREQUENCY**

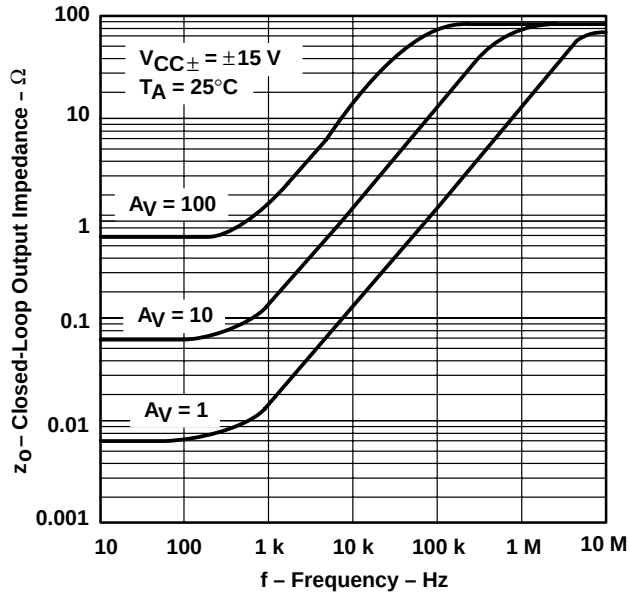



**Figure 72**

**TLE2082 AND TLE2084 CROSSTALK ATTENUATION vs FREQUENCY**

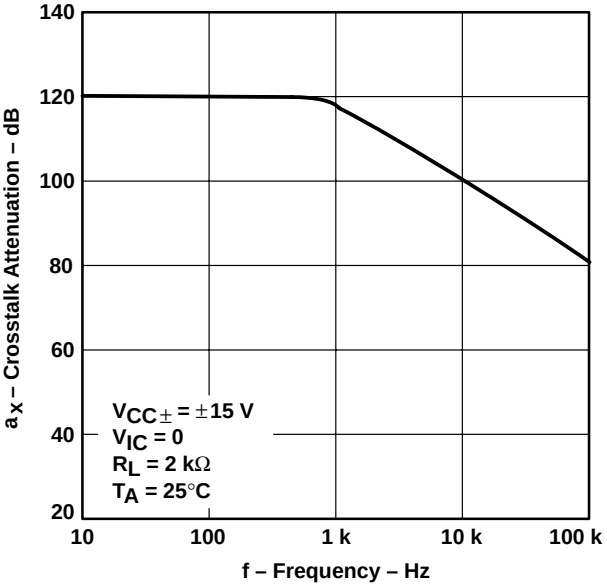



**Figure 73**

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

## APPLICATION INFORMATION

### input characteristics

The TLE208x, TLE208xA, and TLE208xB are specified with a minimum and a maximum input voltage that if exceeded at either input could cause the device to malfunction. Because of the extremely high input impedance and resulting low bias current requirements, the TLE208x, TLE208xA, and TLE208xB are well suited for low-level signal processing; however, leakage currents on printed-circuit boards and sockets can easily exceed bias current requirements and cause degradation in system performance. It is good practice to include guard rings around inputs (see Figure 74). These guards should be driven from a low-impedance source at the same voltage level as the common-mode input.

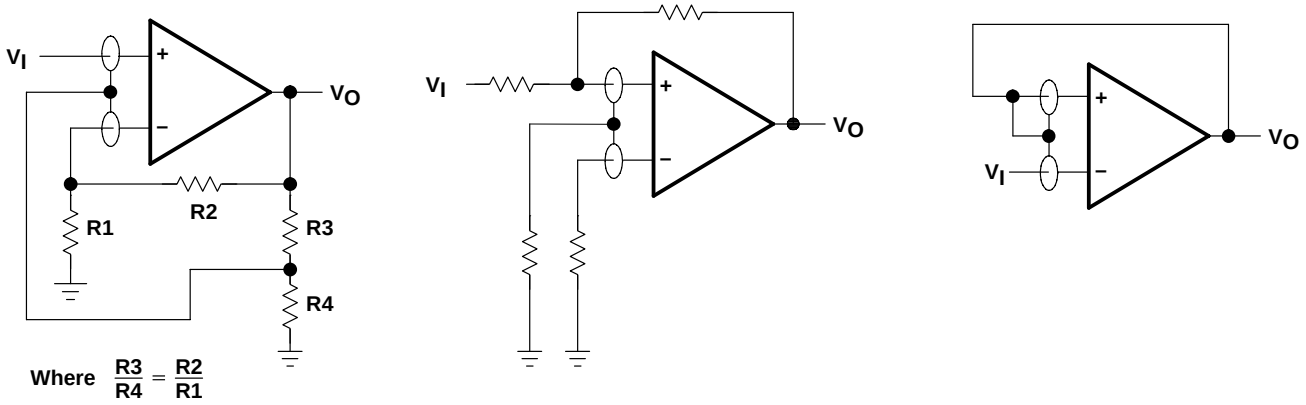



**Figure 74. Use of Guard Rings**

### TLE2081 input offset voltage nulling

The TLE2061 series offers external null pins that can be used to further reduce the input offset voltage. The circuit of Figure 75 can be connected as shown if the feature is desired. When external nulling is not needed, the null pins may be left unconnected.

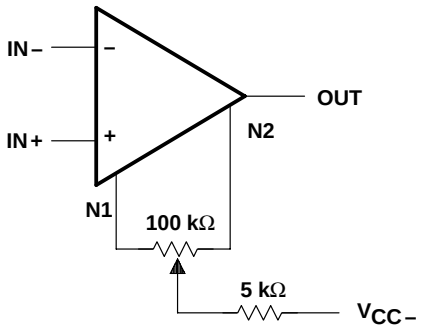



**Figure 75. Input Offset Voltage Nulling**

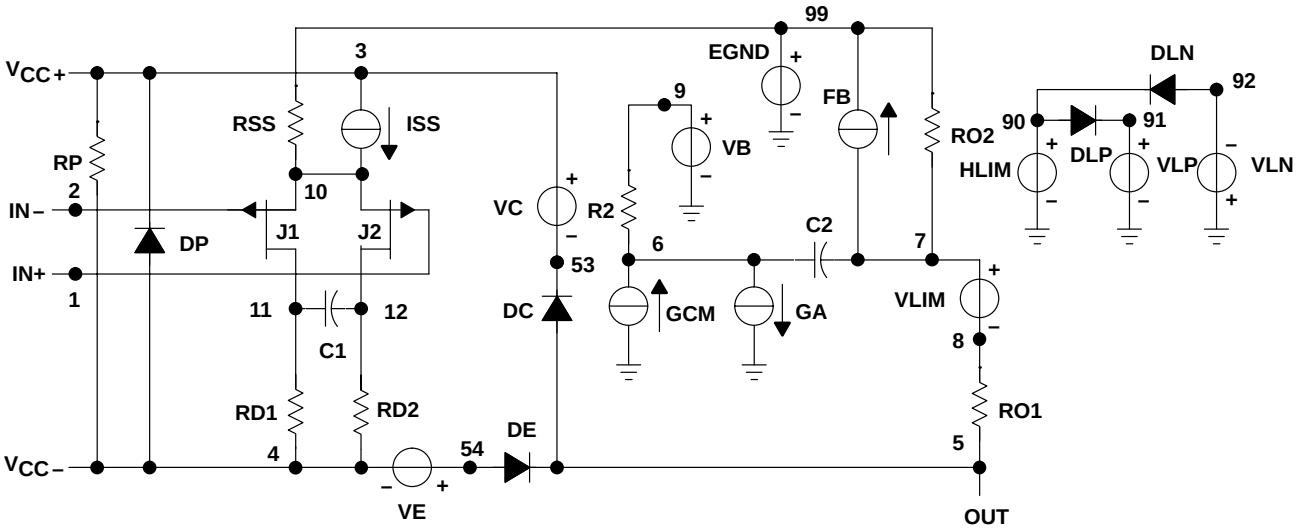
## APPLICATION INFORMATION

### macromodel information

Macromodel information provided was derived using *PSpice*™ *Parts*™ model generation software. The Boyle macromodel (see Note 4) and subcircuit in Figure 58 were generated using the TLE208x typical electrical and operating characteristics at $T_A = 25°C$. Using this information, output simulations of the following key parameters can be generated to a tolerance of 20% (in most cases):

- Maximum positive output voltage swing
- Maximum negative output voltage swing
- Slew rate
- Quiescent power dissipation
- Input bias current
- Open-loop voltage amplification
- Unity-gain frequency
- Common-mode rejection ratio
- Phase margin
- DC output resistance
- AC output resistance
- Short-circuit output current limit

NOTE 4: G.R. Boyle, B.M. Cohn, D. O. Pederson, and J. E. Solomon, “Macromodeling of Integrated Circuit Operational Amplifiers”, *IEEE Journal of Solid-State Circuits*, SC-9, 353 (1974).




```
.SUBCKT TLE208x 1 2 3 4 5
  C1   11   12    2.2E–12
  C2    6    7    10.00E–12
  DC    5   53    DX
  DE   54    5    DX
  DLP  90   91    DX
  DLN  92   90    DX
  DP    4    3    DX
  EGND      99     0 POLY (2) (3,0) (4,0) 0 .5 .5
  FB    7   99    POLY (5) VB VC VE VLP VLN 0
+ .... 5.607E6 –6E6 6E6 6E6 –6E6
  GA    6    0    11 12 333.0E–6
  GCM   0    6    10 99 7.43E–9
  ISS   3   10    DC 400.0E–6
  HLIM 90    0    VLIM 1K
  J1   11    2    10 JX
  J2   12    1    10 JX
  R2    6    9    100.0E3
  RD1   4   11    3.003E3
  RD2   4   12    3.003E3
  R01   8    5    80
  R02   7   99    80
  RP    3    4    27.30E3
  RSS  10   99    500.0E3
  VB    9    0    DC 0
  VC    3   53    DC 2.20
  VE   54    4    DC 2.20
  VLIM  7    8    DC 0
  VLP  91    0    DC 45
  VLN   0   92    DC 45
.MODEL DX D (IS=800.0E–18)
.MODEL JX PJF (IS=15.00E–12 BETA=554.5E–6
+ VTO=–.6)
.ENDS
```

**Figure 76. Boyle Macromodel and Subcircuit**

*PSpice* and *Parts* are trademarks of MicroSim Corporation.

## PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TLE2081ACD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 2081AC | Samples |
| TLE2081ACDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 2081AC | Samples |
| TLE2081ACDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 2081AC | Samples |
| TLE2081ACDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 2081AC | Samples |
| TLE2081ACP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | -40 to 85 | TLE2081AC | Samples |
| TLE2081AID | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | 2081AI | Samples |
| TLE2081AIP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | -40 to 85 | TLE2081AI | Samples |
| TLE2081CD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 2081C | Samples |
| TLE2081CDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 2081C | Samples |
| TLE2081CDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 2081C | Samples |
| TLE2081CP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TLE2081CP | Samples |
| TLE2081CPE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TLE2081CP | Samples |
| TLE2081ID | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | 2081I | Samples |
| TLE2081IDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | 2081I | Samples |
| TLE2081IDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | | 2081I | Samples |
| TLE2081IP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | | TLE2081IP | Samples |
| TLE2082ACD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 2082AC | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TLE2082ACDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 2082AC | Samples |
| TLE2082ACDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | | 2082AC | Samples |
| TLE2082ACDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | | 2082AC | Samples |
| TLE2082ACP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | | TLE2082AC | Samples |
| TLE2082ACPE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | | TLE2082AC | Samples |
| TLE2082AID | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | 2082AI | Samples |
| TLE2082AIDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | 2082AI | Samples |
| TLE2082AIDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | | 2082AI | Samples |
| TLE2082AIDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | | 2082AI | Samples |
| TLE2082AIP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | | TLE2082AI | Samples |
| TLE2082AIPE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | | TLE2082AI | Samples |
| TLE2082CD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 2082C | Samples |
| TLE2082CDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 2082C | Samples |
| TLE2082CDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | | 2082C | Samples |
| TLE2082CDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | | 2082C | Samples |
| TLE2082CP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | | TLE2082CP | Samples |
| TLE2082CPE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | | TLE2082CP | Samples |
| TLE2082ID | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | 2082I | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TLE2082IDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | 2082I | Samples |
| TLE2082IDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | | 2082I | Samples |
| TLE2082IDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | | 2082I | Samples |
| TLE2082IP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | | TLE2082IP | Samples |
| TLE2082IPE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | | TLE2082IP | Samples |
| TLE2084ACDW | ACTIVE | SOIC | DW | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TLE2084AC | Samples |
| TLE2084ACDWG4 | ACTIVE | SOIC | DW | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TLE2084AC | Samples |
| TLE2084ACN | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TLE2084ACN | Samples |
| TLE2084CDW | ACTIVE | SOIC | DW | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TLE2084C | Samples |
| TLE2084CDWG4 | ACTIVE | SOIC | DW | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TLE2084C | Samples |
| TLE2084CDWR | ACTIVE | SOIC | DW | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | | TLE2084C | Samples |
| TLE2084CN | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | | TLE2084CN | Samples |
| TLE2084CNE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | | TLE2084CN | Samples |
| TLE2084IDW | ACTIVE | SOIC | DW | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | TLE2084I | Samples |
| TLE2084IDWG4 | ACTIVE | SOIC | DW | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | TLE2084I | Samples |

**(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), 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)

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

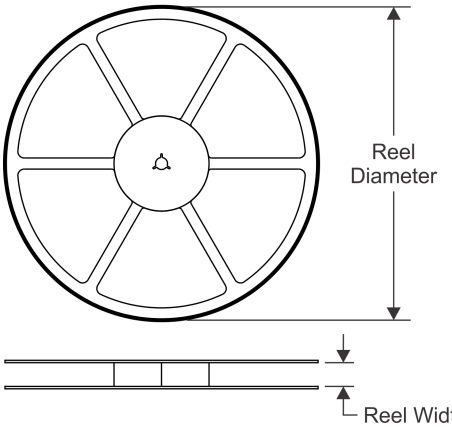
**(4)** There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

**(5)** 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.

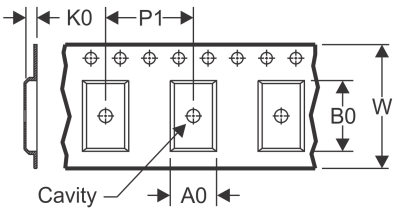
**(6)** Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

## TAPE AND REEL INFORMATION

**REEL DIMENSIONS**

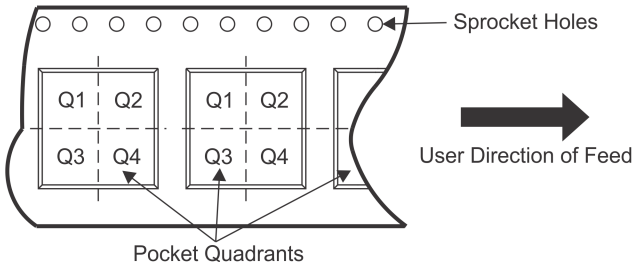



**TAPE DIMENSIONS**




| | |
|---|---|
| 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 |

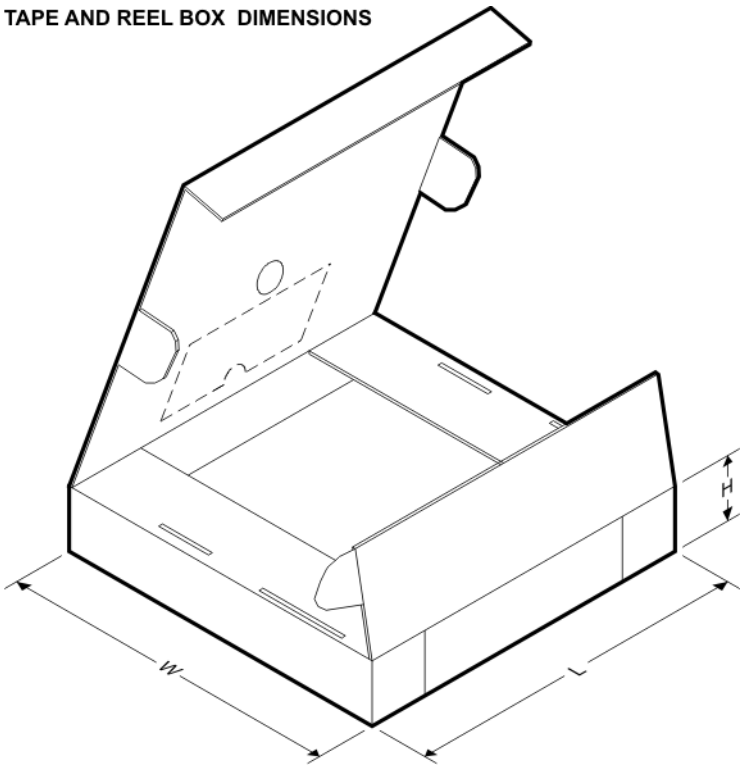
**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**




*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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TLE2081ACDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TLE2081CDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TLE2081IDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TLE2081IDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TLE2082ACDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TLE2082AIDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TLE2082AIDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TLE2082CDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TLE2082IDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TLE2084CDWR | SOIC | DW | 16 | 2000 | 330.0 | 16.4 | 10.75 | 10.7 | 2.7 | 12.0 | 16.0 | Q1 |

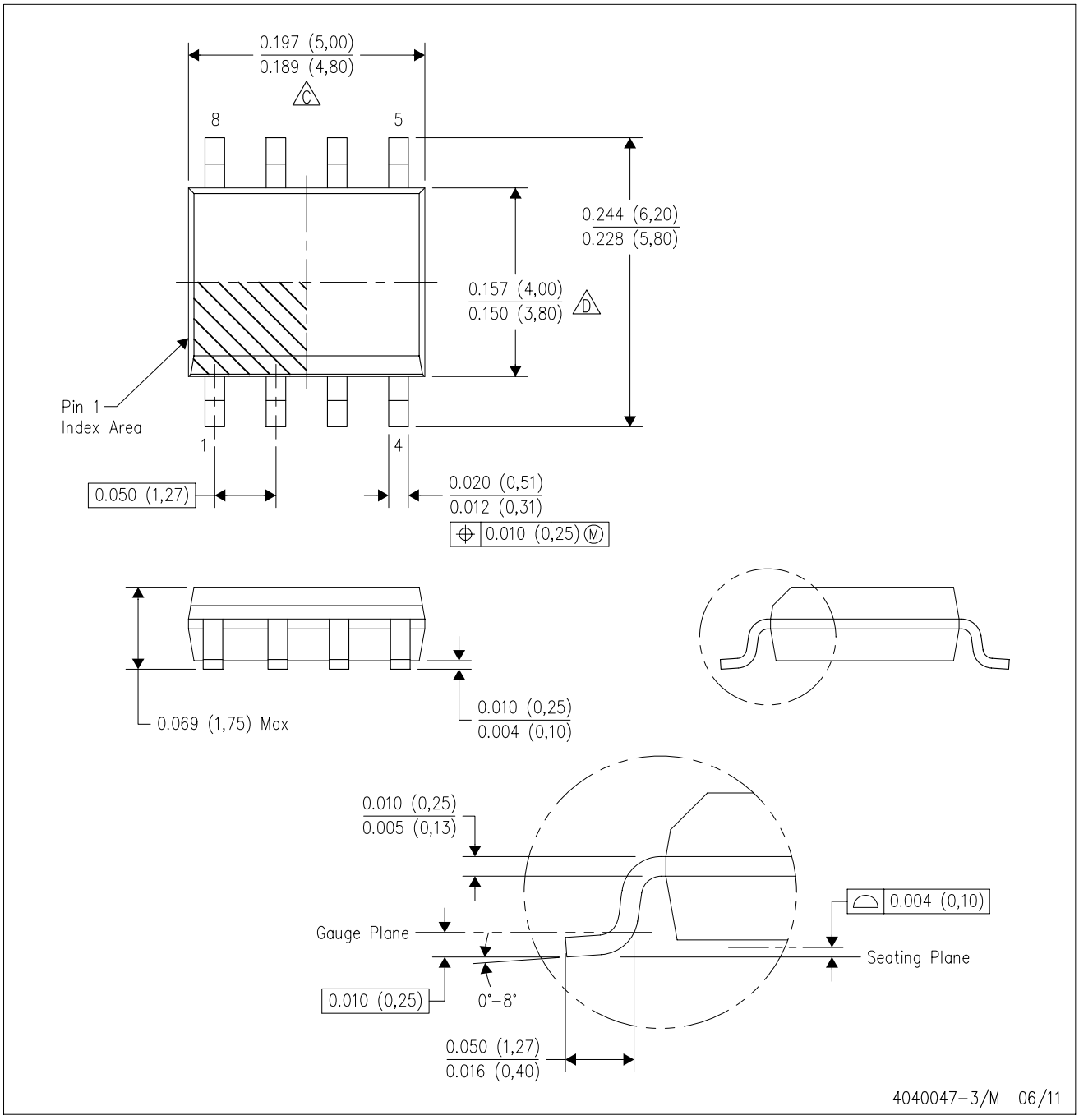
TAPE AND REEL BOX DIMENSIONS




*All dimensions are nominal

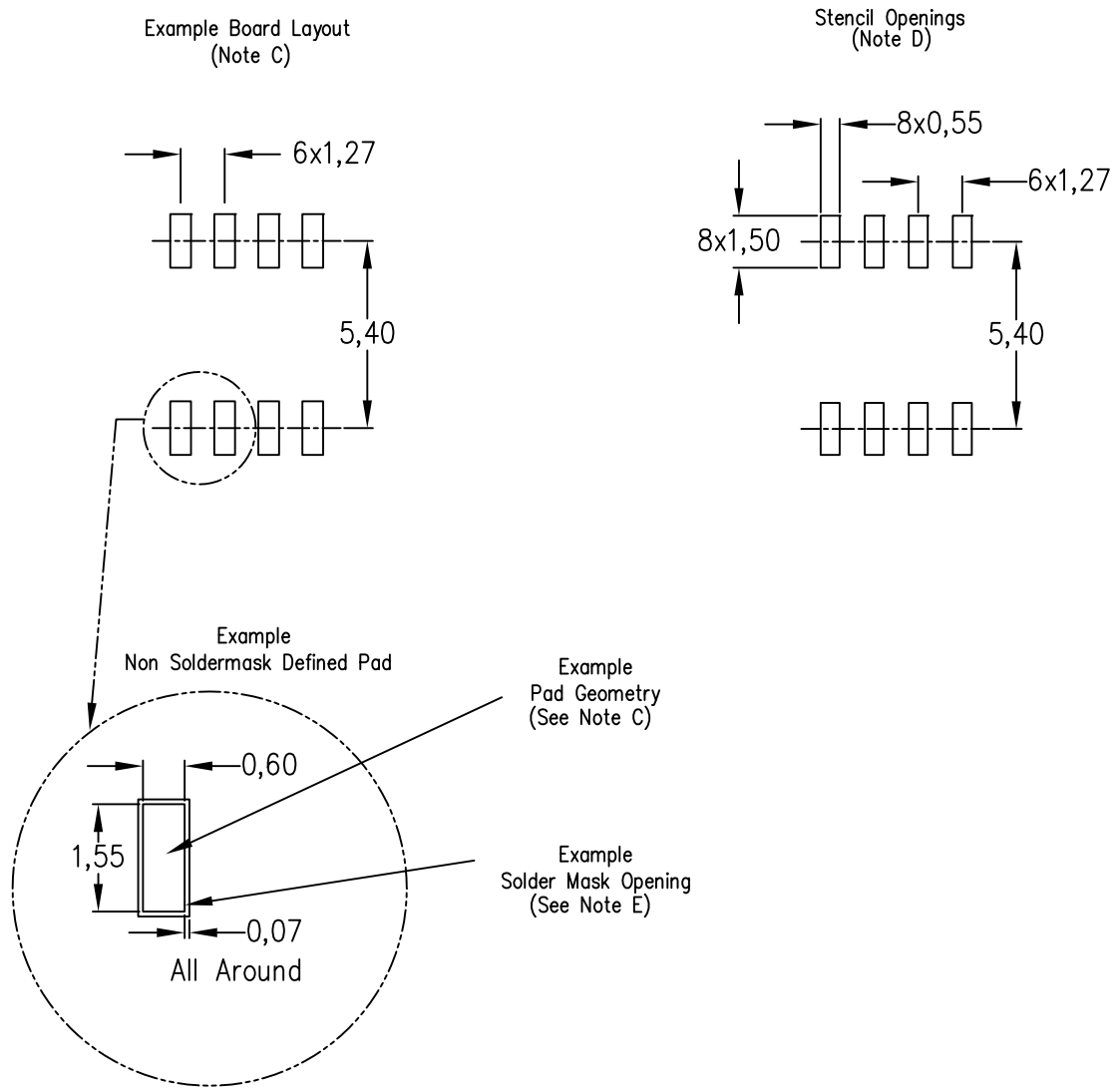
| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---|---|---|---|---|---|---|---|
| TLE2081ACDR | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| TLE2081CDR | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| TLE2081IDR | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| TLE2081IDR | SOIC | D | 8 | 2500 | 367.0 | 367.0 | 38.0 |
| TLE2082ACDR | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| TLE2082AIDR | SOIC | D | 8 | 2500 | 367.0 | 367.0 | 38.0 |
| TLE2082AIDR | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| TLE2082CDR | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| TLE2082IDR | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| TLE2084CDWR | SOIC | DW | 16 | 2000 | 367.0 | 367.0 | 38.0 |

D (R–PDSO–G8) PLASTIC SMALL OUTLINE




NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
E. Reference JEDEC MS–012 variation AA.

D (R–PDSO–G8) PLASTIC SMALL OUTLINE

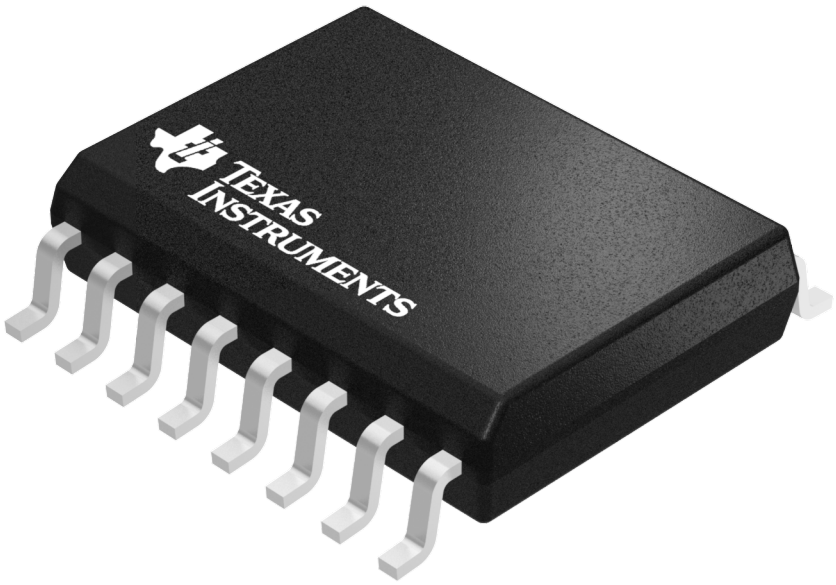



NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC–7351 is recommended for alternate designs.
D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC–7525 for other stencil recommendations.
E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

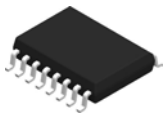
## GENERIC PACKAGE VIEW

# DW 16 SOIC - 2.65 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT




Images above are just a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

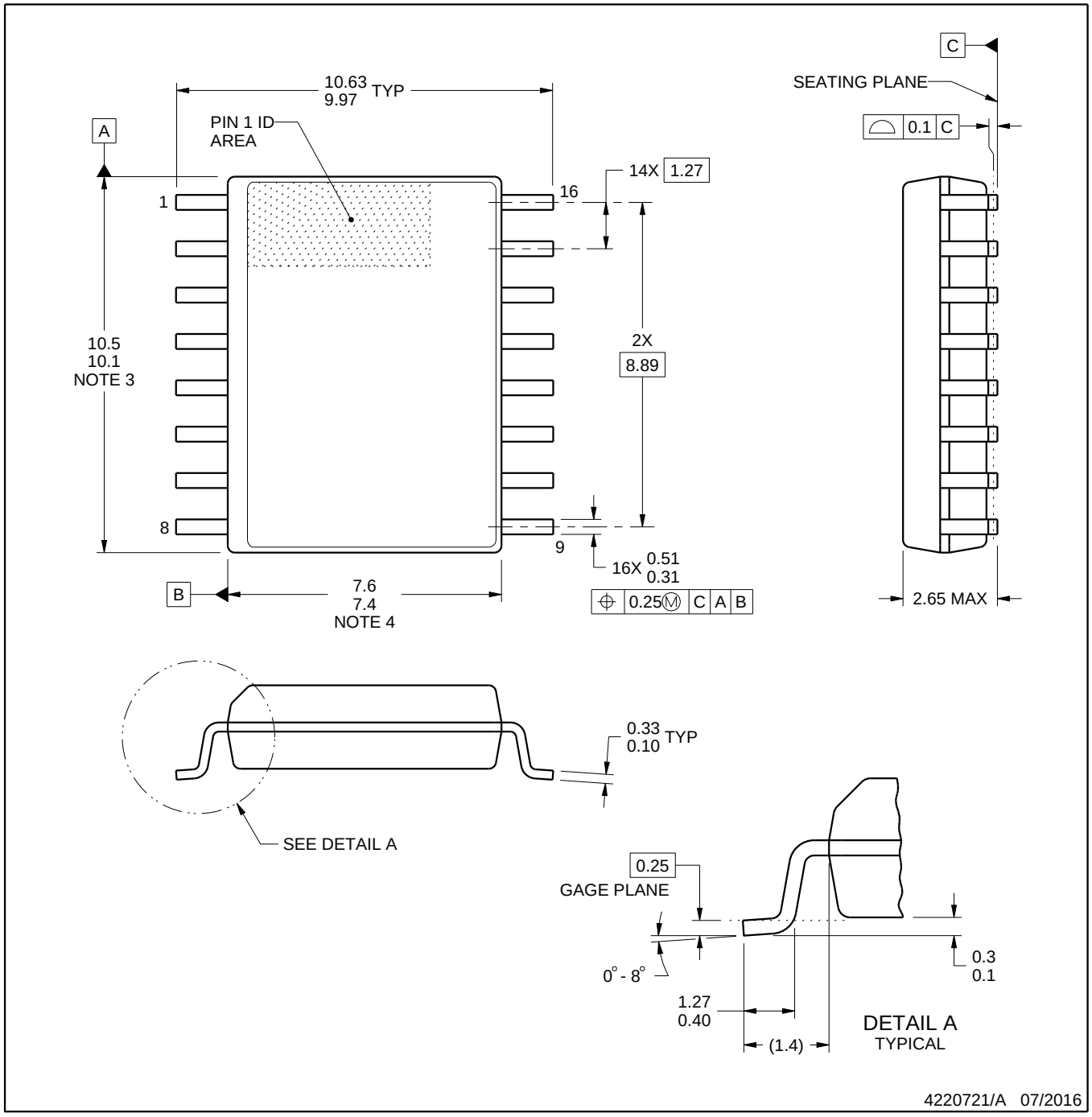


# PACKAGE OUTLINE

## DW0016A

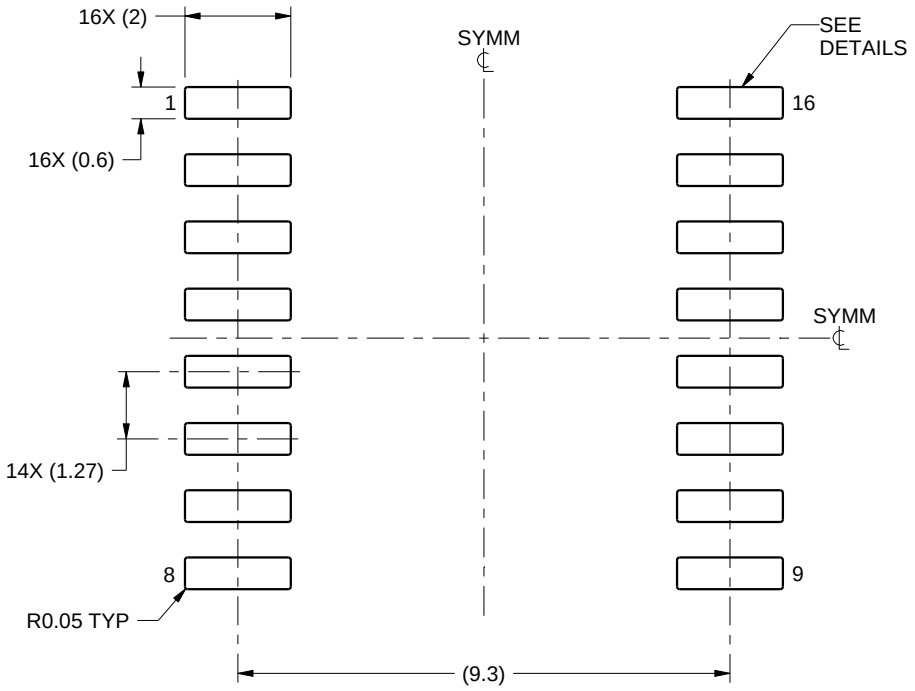
## SOIC - 2.65 mm max height

SOIC

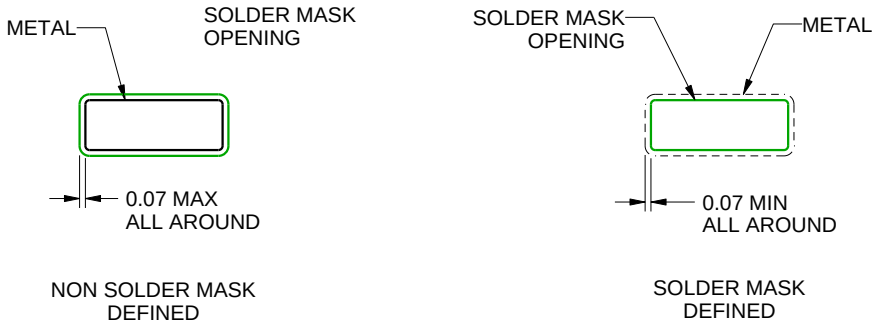



NOTES:

1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.
5. Reference JEDEC registration MS-013.




LAND PATTERN EXAMPLE
SCALE:7X

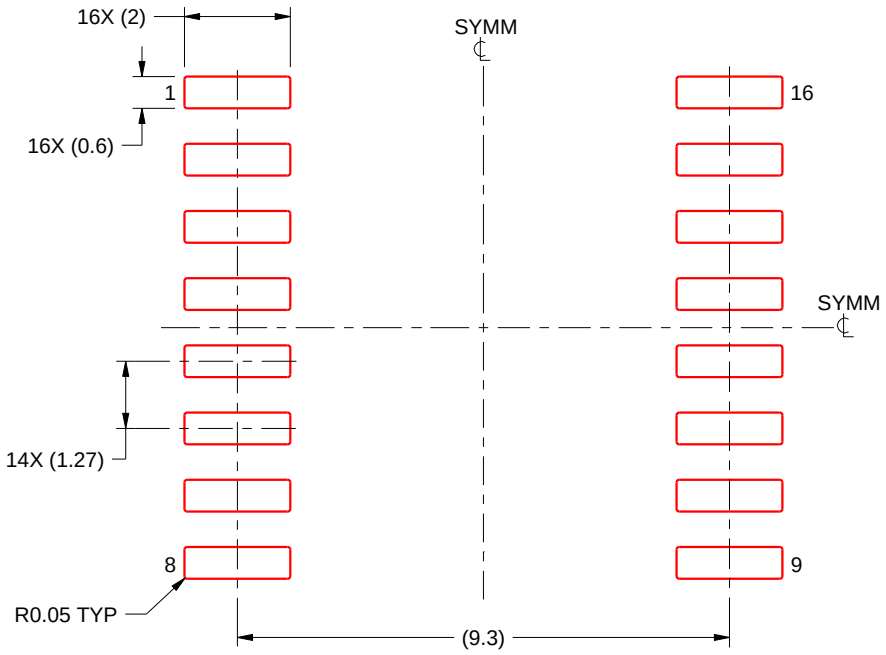



SOLDER MASK DETAILS

4220721/A 07/2016

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



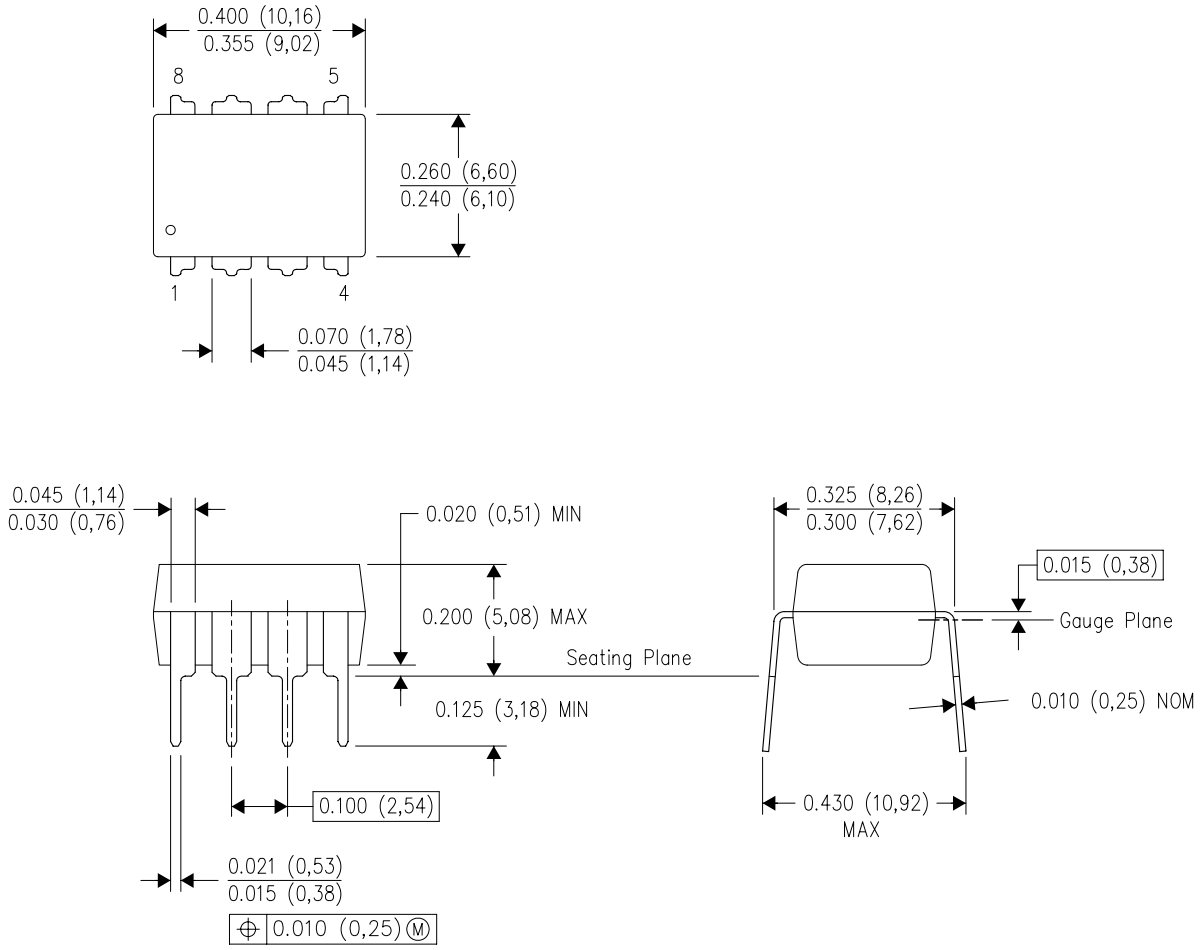

SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:7X

4220721/A 07/2016

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

P (R–PDIP–T8) PLASTIC DUAL–IN–LINE PACKAGE

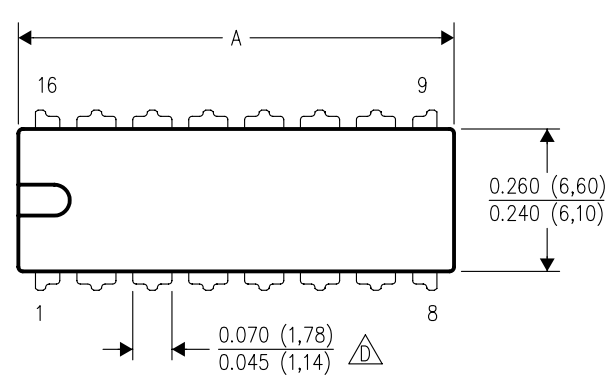



NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Falls within JEDEC MS–001 variation BA.

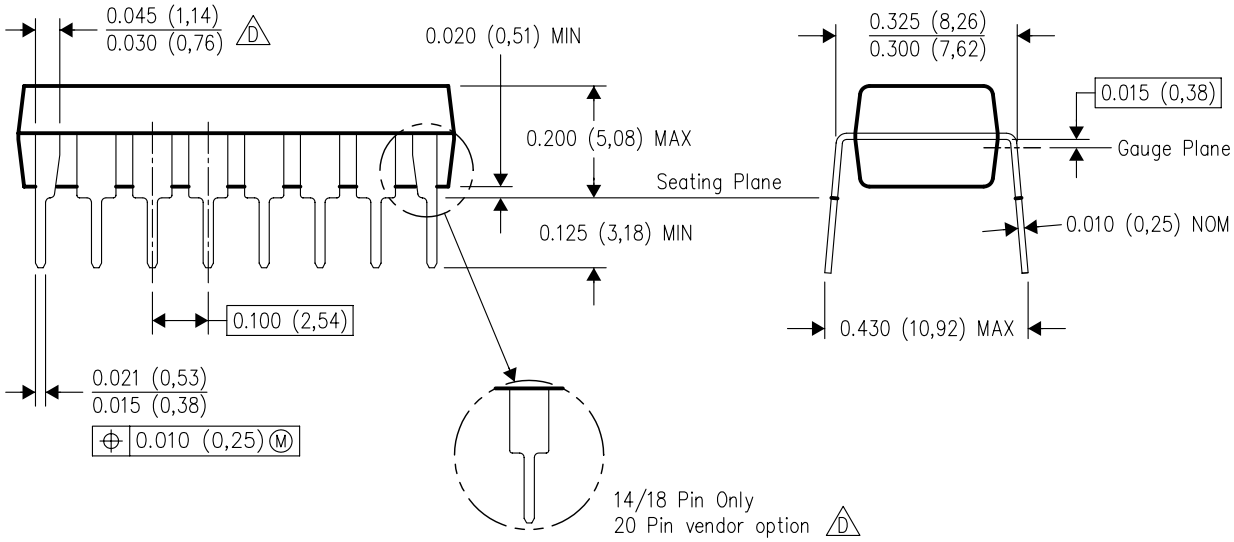
## N (R–PDIP–T**)

## PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN




| DIM \ PINS ** | 14 | 16 | 18 | 20 |
|---|---|---|---|---|
| A MAX | 0.775 (19,69) | 0.775 (19,69) | 0.920 (23,37) | 1.060 (26,92) |
| A MIN | 0.745 (18,92) | 0.745 (18,92) | 0.850 (21,59) | 0.940 (23,88) |
| MS–001 VARIATION (C) | AA | BB | AC | AD |




4040049/E 12/2002

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

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TI may expressly designate certain products as completing a particular qualification (e.g., Q100, Military Grade, or Enhanced Product). Designers agree that it has the necessary expertise to select the product with the appropriate qualification designation for their applications and that proper product selection is at Designers' own risk. Designers are solely responsible for compliance with all legal and regulatory requirements in connection with such selection.

Designer will fully indemnify TI and its representatives against any damages, costs, losses, and/or liabilities arising out of Designer's non-compliance with the terms and provisions of this Notice.

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