- **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.

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

LinCMOS is a trademark of Texas Instruments.

**TEXAS INSTRUMENTS**

### 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 | — | — |

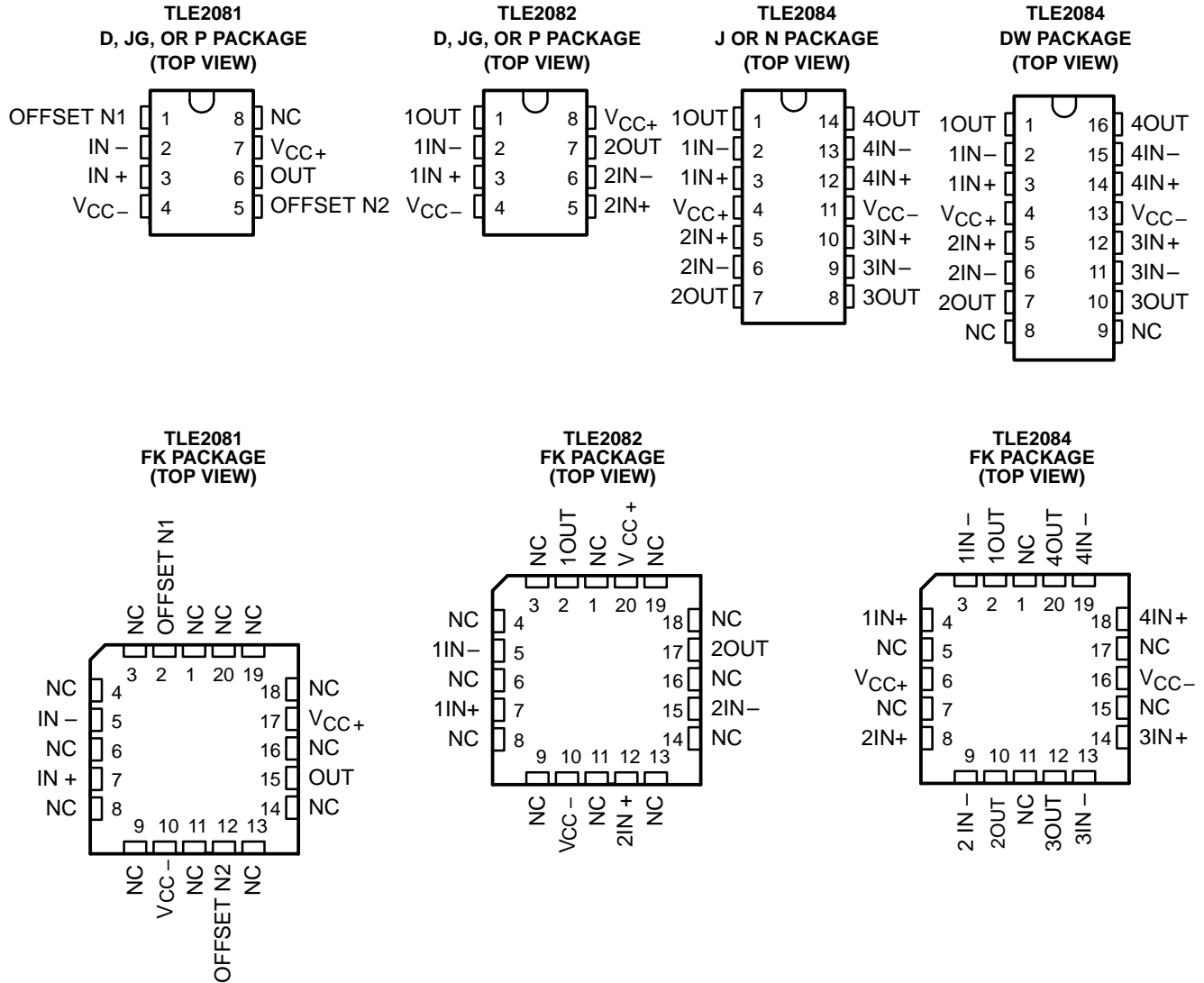† The DW packages are available taped and reeled. Add R suffix to device type (e.g., TLE2084ACDWR).
‡ Chip forms are tested at $T_A$ = 25°C only.

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

| | | |
|---|---|---|
| OFFSET N1 | 1 | 8 | NC |
| IN − | 2 | 7 | $V_{CC+}$ |
| IN + | 3 | 6 | OUT |
| $V_{CC−}$ | 4 | 5 | OFFSET N2 |

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

| | | |
|---|---|---|
| 1OUT | 1 | 8 | $V_{CC+}$ |
| 1IN− | 2 | 7 | 2OUT |
| 1IN + | 3 | 6 | 2IN− |
| $V_{CC−}$ | 4 | 5 | 2IN+ |

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

| | | |
|---|---|---|
| 1OUT | 1 | 14 | 4OUT |
| 1IN− | 2 | 13 | 4IN− |
| 1IN+ | 3 | 12 | 4IN+ |
| $V_{CC+}$ | 4 | 11 | $V_{CC−}$ |
| 2IN+ | 5 | 10 | 3IN+ |
| 2IN− | 6 | 9 | 3IN− |
| 2OUT | 7 | 8 | 3OUT |

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

| | | |
|---|---|---|
| 1OUT | 1 | 16 | 4OUT |
| 1IN− | 2 | 15 | 4IN− |
| 1IN+ | 3 | 14 | 4IN+ |
| $V_{CC+}$ | 4 | 13 | $V_{CC−}$ |
| 2IN+ | 5 | 12 | 3IN+ |
| 2IN− | 6 | 11 | 3IN− |
| 2OUT | 7 | 10 | 3OUT |
| NC | 8 | 9 | NC |

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

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

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

NC – No internal connection

## symbol
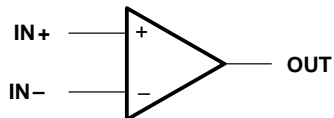
IN+ +

IN− −

OUT

## 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**

85

58

OFFSET N1 — (1)  $V_{CC+}$
IN+ — (3)  (7)
IN− — (2)  (6) OUT
OFFSET N2 — (5)  (4)
 $V_{CC-}$

**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.**

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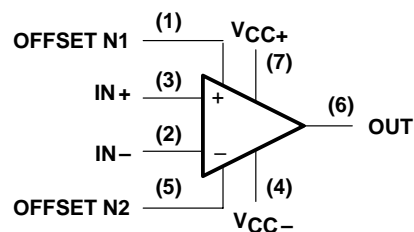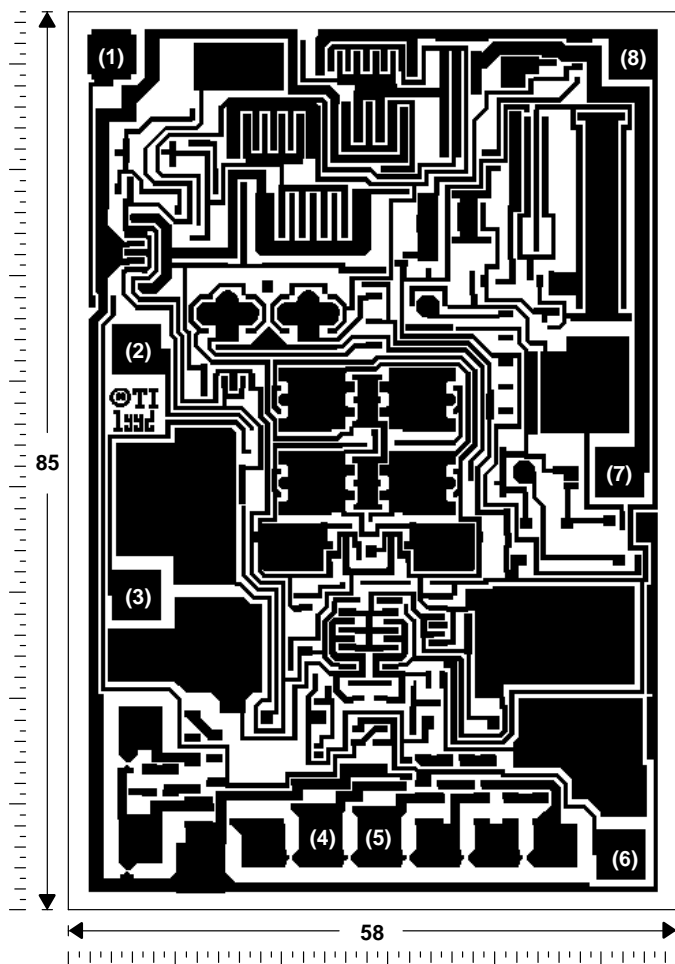
## TLE2082Y chip information

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.**
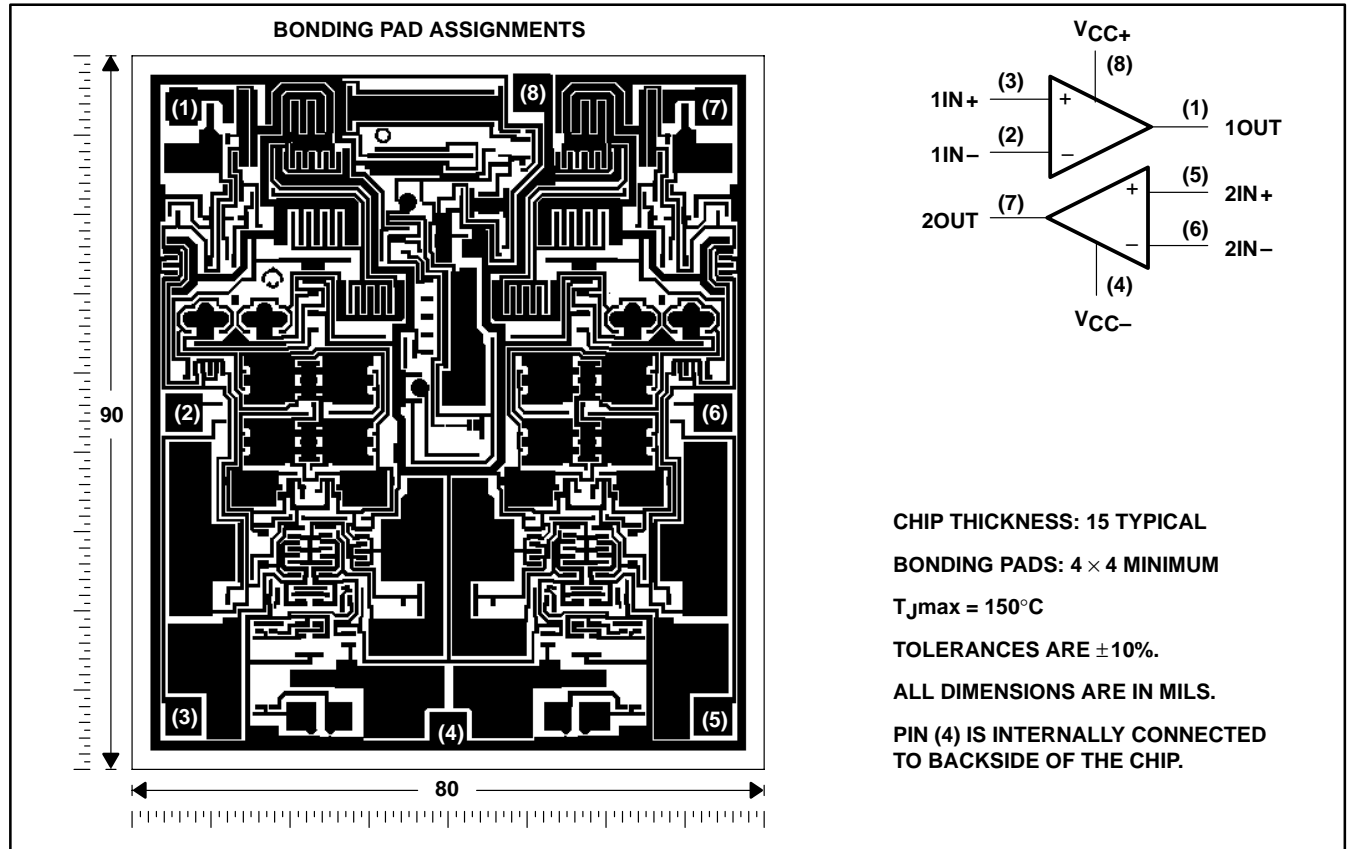
## TLE2084Y chip information

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.
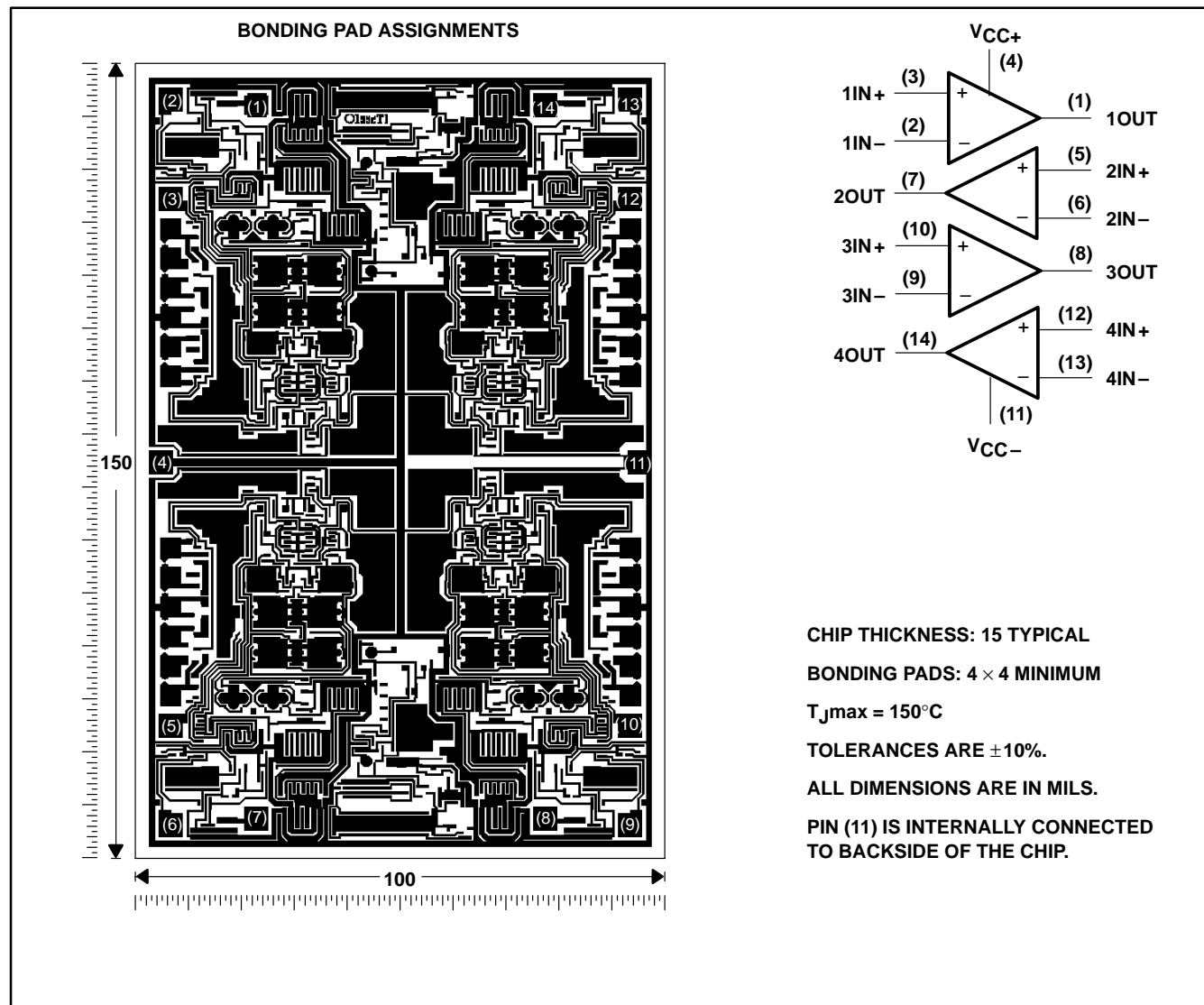
**BONDING PAD ASSIGNMENTS**

150

100

**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.**

$V_{CC+}$
(4)

1IN+ (3)

1IN− (2)

1OUT (1)

2OUT (7)

2IN+ (5)

2IN− (6)

3IN+ (10)

3IN− (9)

3OUT (8)

4OUT (14)

4IN+ (12)

4IN− (13)

(11)

$V_{CC-}$

TEXAS
INSTRUMENTS

POST OFFICE BOX 655303 ● DALLAS, TEXAS 75265

**equivalent schematic (each channel)**
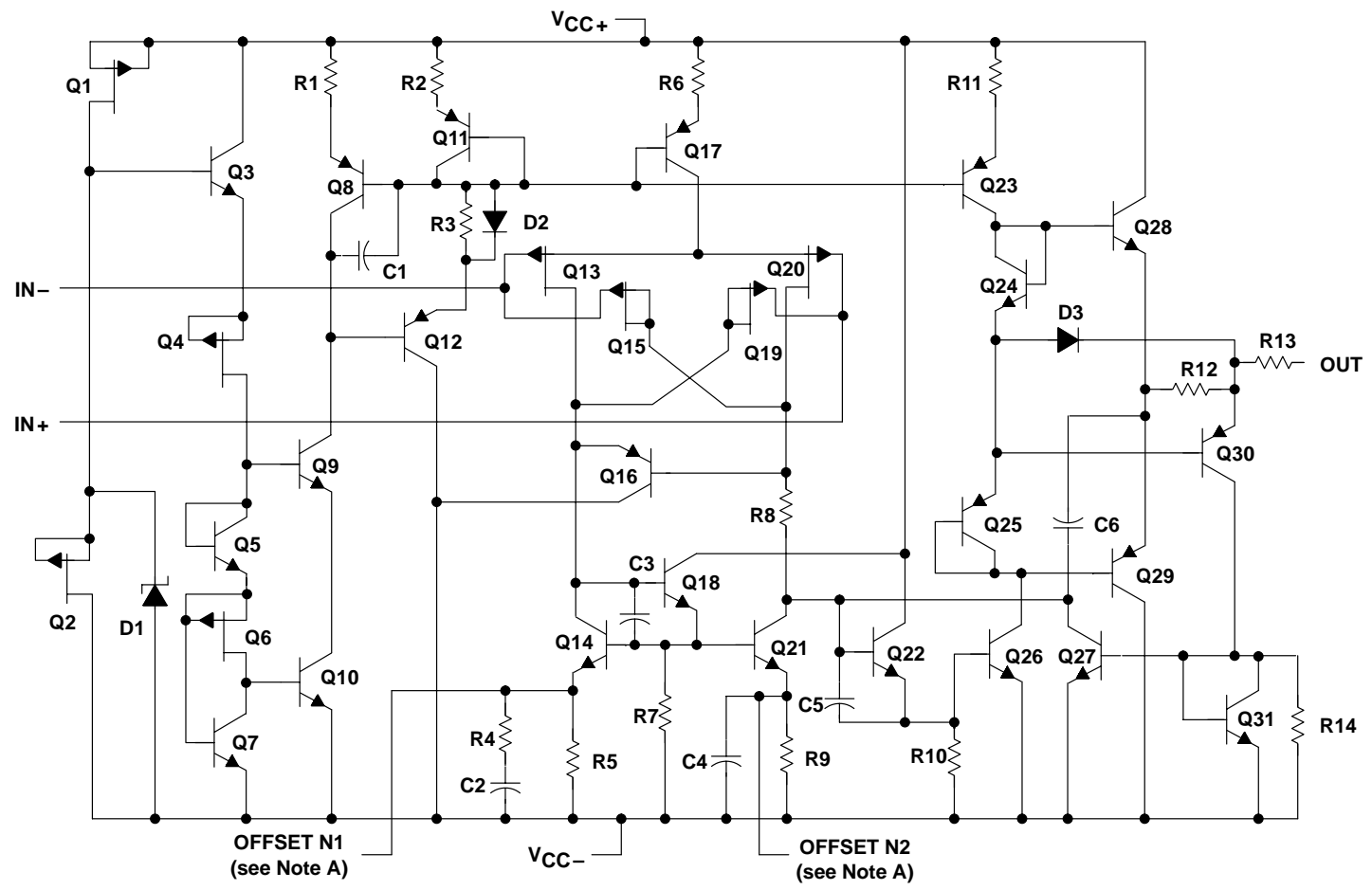


NOTE A: OFFSET N1 and OFFSET N2 are only availiable on the TLE2081x devices.

| 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 | $T_A \leq 25°C$ 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 MIN | C SUFFIX MAX | I SUFFIX MIN | I SUFFIX MAX | M SUFFIX MIN | M SUFFIX MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| 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 |

![Texas Instruments logo] **TEXAS INSTRUMENTS**

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

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081C MIN | TLE2081C TYP | TLE2081C MAX | TLE2081AC MIN | TLE2081AC TYP | TLE2081AC MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_{IO}$ | Input offset voltage | $V_{IC} = 0$,     $V_O = 0$, $R_S = 50\ \Omega$ | | 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 | $R_S = 50\ \Omega$ | | 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 | $V_O = \pm 2.3$ V | $I_O = -200$ 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 | $V_O = \pm 2.3$ V | $R_L = 600\ \Omega$ | 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 | $V_{IC} = V_{ICR}\text{min}$, $V_O = 0$,     $R_S = 50\ \Omega$ | | 25°C | 70 | 89 | | 70 | 89 | | dB |
| | | | | Full range | 68 | | | 68 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm} = \pm 5$ V to $\pm 15$ V, $V_O = 0$,     $R_S = 50\ \Omega$ | | 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, $V_{CC\pm} = \pm 5$ 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, $V_{CC\pm} = \pm 5$ V**

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081C | | | TLE2081AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR+ | Positive slew rate | $V_{O(PP)} = \pm 2.3$ V, $A_{VD} = -1$, $R_L = 2$ kΩ, $C_L = 100$ pF, 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, $R_L = 2$ kΩ, $C_L = 25$ pF, 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, $R_L = 2$ kΩ, $C_L = 25$ pF, See Figure 2 | | 25°C | | 56° | | | 56° | | |

† Full range is 0°C to 70°C.

**TEXAS INSTRUMENTS**

**TLE2081C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm15$ V (unless otherwise noted)**

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081C | | | TLE2081AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{IC} = 0$, $V_O = 0$, $R_S = 50\ \Omega$ | | 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 | $R_S = 50\ \Omega$ | | 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 | $I_O = -200\ \mu A$ | | 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 | $I_O = 200\ \mu A$ | | 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 | $V_O = \pm 10$ V | $R_L = 600\ \Omega$ | 25°C | 80 | 96 | | 80 | 96 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| | | | $R_L = 2\ k\Omega$ | 25°C | 90 | 109 | | 90 | 109 | | |
| | | | | Full range | 89 | | | 89 | | | |
| | | | $R_L = 10\ k\Omega$ | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | | Full range | 94 | | | 94 | | | |
| $r_i$ | Input resistance | $V_{IC} = 0$ | | 25°C | | $10^{12}$ | | | $10^{12}$ | | $\Omega$ |
| $c_i$ | 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 | | $\Omega$ |
| CMRR | Common-mode rejection ratio | $V_{IC} = V_{ICR}min$, $V_O = 0$, $R_S = 50\ \Omega$ | | 25°C | 80 | 98 | | 80 | 98 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm} = \pm5$ V to $\pm15$ V, $V_O = 0$, $R_S = 50\ \Omega$ | | 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 | | 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 | $R_S$ = 20 Ω, See Figure 3 | 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.

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

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081I MIN | TLE2081I TYP | TLE2081I MAX | TLE2081AI MIN | TLE2081AI TYP | TLE2081AI MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_{IO}$ | Input offset voltage | $V_{IC} = 0$, $V_O = 0$, $R_S = 50\ \Omega$, | | 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 | $R_S = 50\ \Omega$ | | 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 | $V_O = \pm 2.3$ V | $R_L = 600\ \Omega$ | 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 | $V_{IC} = V_{ICR}min$, $V_O = 0$, $R_S = 50\ \Omega$ | | 25°C | 70 | 89 | | 70 | 89 | | dB |
| | | | | Full range | 68 | | | 68 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm} = \pm 5$ V to $\pm 15$ V, $V_O = 0$, $R_S = 50\ \Omega$ | | 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, $V_{CC\pm} = \pm 5$ 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, $V_{CC\pm} = \pm 5$ V**

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081I | | | TLE2081AI | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR + | Positive slew rate | $V_{O(PP)} = \pm 2.3$ V, $A_{VD} = -1$, $R_L = 2$ k$\Omega$, $C_L = 100$ pF,  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, $R_L = 1$ k$\Omega$, $C_L = 100$ pF | To 10 mV | 25°C | | 0.25 | | | 0.25 | | µs |
| | | | To 1 mV | | | 0.4 | | | 0.4 | | |
| $V_n$ | Equivalent input noise voltage | | f = 10 Hz | 25°C | | 28 | | | 28 | | nV/$\sqrt{Hz}$ |
| | | | f = 10 kHz | | | 11.6 | | | 11.6 | | |
| $V_{N(PP)}$ | Peak-to-peak equivalent input noise voltage | $R_S = 20$ $\Omega$, See Figure 3 | 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/$\sqrt{Hz}$ |
| THD + N | Total harmonic distortion plus noise | $V_{O(PP)} = 5$ V, $A_{VD} = 10$, f = 1 kHz, $R_L = 2$ k$\Omega$, $R_S = 25$ $\Omega$ | | 25°C | | 0.013% | | | 0.013% | | |
| $B_1$ | Unity-gain bandwidth | $V_I = 10$ mV, $R_L = 2$ k$\Omega$, $C_L = 25$ pF,  See Figure 2 | | 25°C | | 9.4 | | | 9.4 | | MHz |
| $B_{OM}$ | Maximum output-swing bandwidth | $V_{O(PP)} = 4$ V, $A_{VD} = -1$, $R_L = 2$ k$\Omega$ , $C_L = 25$ pF | | 25°C | | 2.8 | | | 2.8 | | MHz |
| $\phi_m$ | Phase margin at unity gain | $V_I = 10$ mV, $R_L = 2$ k$\Omega$, $C_L = 25$ pF,  See Figure 2 | | 25°C | | 56° | | | 56° | | |

† Full range is −40°C to 85°C.

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

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081I MIN | TLE2081I TYP | TLE2081I MAX | TLE2081AI MIN | TLE2081AI TYP | TLE2081AI MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_{IO}$ | Input offset voltage | $V_{IC} = 0$, $V_O = 0$, $R_S = 50\ \Omega$, | | 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 | $R_S = 50\ \Omega$ | | 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 | $I_O = -200\ \mu A$ | | 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 | $I_O = 200\ \mu A$ | | 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 | $V_O = \pm 10$ V | $R_L = 600\ \Omega$ | 25°C | 80 | 96 | | 80 | 96 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| | | | $R_L = 2\ k\Omega$ | 25°C | 90 | 109 | | 90 | 109 | | |
| | | | | Full range | 89 | | | 89 | | | |
| | | | $R_L = 10\ k\Omega$ | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | | Full range | 94 | | | 94 | | | |
| $r_i$ | Input resistance | $V_{IC} = 0$ | | 25°C | | $10^{12}$ | | | $10^{12}$ | | $\Omega$ |
| $c_i$ | 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 | | $\Omega$ |
| CMRR | Common-mode rejection ratio | $V_{IC} = V_{ICR}min$, $V_O = 0$, $R_S = 50\ \Omega$ | | 25°C | 80 | 98 | | 80 | 98 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm} = \pm 5$ V to $\pm 15$ V, $V_O = 0$, $R_S = 50\ \Omega$ | | 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, $V_{CC\pm} = \pm15$ 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, $V_{CC\pm} = \pm15$ V

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081I | | | TLE2081AI | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR + | Positive slew rate | $V_{O(PP)} = \pm10$ 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 | 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 | | 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 | $R_S = 20$ Ω, See Figure 3 | 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, $C_L = 25$ 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, $A_{VD} = -1$, $R_L = 2$ 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 −40°C to 85°C.

## TLE2081M electrical characteristics at specified free-air temperature, $V_{CC\pm} = \pm5$ V (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081M MIN | TYP | MAX | TLE2081AM MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_{IO}$ | Input offset voltage | $V_{IC} = 0$,   $V_O = 0$, $R_S = 50\,\Omega$ | | 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 | $R_S = 50\,\Omega$ | | 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 | | $I_O = -200\,\mu A$ | 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 | | $I_O = 200\,\mu A$ | 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 | $V_O = \pm 2.3$ V | $R_L = 600\,\Omega$ | 25°C | 80 | 91 | | 80 | 91 | | dB |
| | | | | Full range | 78 | | | 78 | | | |
| | | | $R_L = 2\,k\Omega$ | 25°C | 90 | 100 | | 90 | 100 | | |
| | | | | Full range | 88 | | | 88 | | | |
| | | | $R_L = 10\,k\Omega$ | 25°C | 95 | 106 | | 95 | 106 | | |
| | | | | Full range | 93 | | | 93 | | | |
| $r_i$ | Input resistance | $V_{IC} = 0$ | | 25°C | | $10^{12}$ | | | $10^{12}$ | | $\Omega$ |
| $c_i$ | 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 | | $\Omega$ |
| CMRR | Common-mode rejection ratio | $V_{IC} = V_{ICR}min$, $V_O = 0$,   $R_S = 50\,\Omega$ | | 25°C | 70 | 89 | | 70 | 89 | | dB |
| | | | | Full range | 68 | | | 68 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm} = \pm5$ V to $\pm15$ V, $V_O = 0$,   $R_S = 50\,\Omega$ | | 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, $V_{CC\pm} = \pm5$ 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, $V_{CC\pm} = \pm5$ V**

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081M | | | TLE2081AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR + | Positive slew rate | $V_{O(PP)} = \pm2.3$ 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 | | 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 | $R_S = 20$ Ω, See Figure 3 | 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, $V_{CC\pm} = \pm 15$ V (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2081M MIN | TLE2081M TYP | TLE2081M MAX | TLE2081AM MIN | TLE2081AM TYP | TLE2081AM MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_{IO}$ | Input offset voltage | $V_{IC} = 0$, $V_O = 0$, $R_S = 50\ \Omega$ | | 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 | $R_S = 50\ \Omega$ | | 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 | $I_O = -200\ \mu A$ | | 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 | $I_O = 200\ \mu A$ | | 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 | $V_O = \pm 10$ V | $R_L = 600\ \Omega$ | 25°C | 80 | 96 | | 80 | 96 | | dB |
| | | | | Full range | 78 | | | 78 | | | |
| | | | $R_L = 2\ k\Omega$ | 25°C | 90 | 109 | | 90 | 109 | | |
| | | | | Full range | 88 | | | 88 | | | |
| | | | $R_L = 10\ k\Omega$ | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | | Full range | 93 | | | 93 | | | |
| $r_i$ | Input resistance | $V_{IC} = 0$ | | 25°C | | $10^{12}$ | | | $10^{12}$ | | $\Omega$ |
| $c_i$ | 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 | | $\Omega$ |
| CMRR | Common-mode rejection ratio | $V_{IC} = V_{ICR}min$, $V_O = 0$, $R_S = 50\ \Omega$ | | 25°C | 80 | 98 | | 80 | 98 | | dB |
| | | | | Full range | 78 | | | 78 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm} = \pm 5$ V to $\pm 15$ V, $V_O = 0$, $R_S = 50\ \Omega$ | | 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, $V_{CC\pm} = \pm15$ 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, $V_{CC\pm} = \pm15$ 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 | | $f = 10$ Hz | 25°C | | 28 | | | 28 | | nV/√Hz |
| | | | $f = 10$ kHz | | | 11.6 | | | 11.6 | | |
| $V_{N(PP)}$ | Peak-to-peak equivalent input noise voltage | $R_S = 20$ Ω, See Figure 3 | $f = 10$ 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.

**TEXAS INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

## TLE2081Y electrical characteristics at $V_{CC\pm} = \pm15$ V, $T_A = 25°C$

| PARAMETER | | TEST CONDITIONS | | TLE2081Y | | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{IC} = 0$, $V_O = 0$, $R_S = 50\ \Omega$ | | | 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 | $R_S = 50\ \Omega$ | | 15 to −11 | 15 to 11.9 | | V |
| $V_{OM+}$ | Maximum positive peak output voltage swing | $I_O = -200\ \mu A$ | | 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 | $I_O = 200\ \mu A$ | | −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 | $V_O = \pm 10$ V | $R_L = 600\ \Omega$ | 80 | 96 | | dB |
| | | | $R_L = 2\ k\Omega$ | 90 | 109 | | |
| | | | $R_L = 10\ k\Omega$ | 95 | 118 | | |
| $r_i$ | Input resistance | $V_{IC} = 0$ | | | $10^{12}$ | | $\Omega$ |
| $c_i$ | 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 | | $\Omega$ |
| CMRR | Common-mode rejection ratio | $V_{IC} = V_{ICR}min$, $V_O = 0$, $R_S = 50\ \Omega$ | | 80 | 98 | | dB |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm} = \pm5$ V to $\pm15$ V, $V_O = 0$, $R_S = 50\ \Omega$ | | 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, $V_{CC\pm} = \pm5$ V (unless otherwise noted)**

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2082C | | | TLE2082AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{IC} = 0$, $V_O = 0$, $R_S = 50\ \Omega$ | | 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 | $R_S = 50\ \Omega$ | | 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 | $V_O = \pm 2.3$ V | $R_L = 600\ \Omega$ | 25°C | 80 | 91 | | 80 | 91 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| | | | $R_L = 2$ k$\Omega$ | 25°C | 90 | 100 | | 90 | 100 | | |
| | | | | Full range | 89 | | | 89 | | | |
| | | | $R_L = 10$ k$\Omega$ | 25°C | 95 | 106 | | 95 | 106 | | |
| | | | | Full range | 94 | | | 94 | | | |
| $r_i$ | Input resistance | $V_{IC} = 0$ | | 25°C | | $10^{12}$ | | | $10^{12}$ | | $\Omega$ |
| $c_i$ | 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 | | $\Omega$ |
| CMRR | Common-mode rejection ratio | $V_{IC} = V_{ICR}$min, $V_O = 0$, $R_S = 50\ \Omega$ | | 25°C | 70 | 89 | | 70 | 89 | | dB |
| | | | | Full range | 68 | | | 68 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm} / \Delta V_{IO}$) | $V_{CC\pm} = \pm5$ V to $\pm15$ V, $V_O = 0$, $R_S = 50\ \Omega$ | | 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.

**TEXAS INSTRUMENTS**

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

| PARAMETER | | TEST CONDITIONS | | $T_A$ | TLE2082C | | | TLE2082AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| | Crosstalk attenuation | $V_{IC} = 0$, | $R_L = 2$ k$\Omega$ | 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, $V_{CC\pm} = \pm 5$ V**

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

† Full range is 0°C to 70°C.

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

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2082C MIN | TLE2082C TYP | TLE2082C MAX | TLE2082AC MIN | TLE2082AC TYP | TLE2082AC MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_{IO}$ | Input offset voltage | $V_{IC} = 0$, $V_O = 0$, $R_S = 50\ \Omega$ | | 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 | $R_S = 50\ \Omega$ | | 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 | $V_O = \pm 10$ V | $I_O = -200\ \mu A$ | 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 | | $I_O = 200\ \mu A$ | 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 | $V_O = \pm 10$ V | $R_L = 600\ \Omega$ | 25°C | 80 | 96 | | 80 | 96 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| | | | $R_L = 2\ k\Omega$ | 25°C | 90 | 109 | | 90 | 109 | | |
| | | | | Full range | 89 | | | 89 | | | |
| | | | $R_L = 10\ k\Omega$ | 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 | $V_{IC} = V_{ICR}\text{min}$, $V_O = 0$, $R_S = 50\ \Omega$ | | 25°C | 80 | 98 | | 80 | 98 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm} = \pm 5$ V to $\pm 15$ V, $V_O = 0$, $R_S = 50\ \Omega$ | | 25°C | 82 | 99 | | 82 | 99 | | dB |
| | | | | Full range | 81 | | | 81 | | | |

† Full range is 0°C to 70°C.

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**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 | $V_{IC} = 0$, | $R_L = 2\ k\Omega$ | 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 | $V_{O(PP)} = 10\ V$, $R_L = 2\ k\Omega$, 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, $R_L = 1\ k\Omega$, $C_L = 100\ pF$ | To 10 mV | 25°C | | 0.4 | | | 0.4 | | µs |
| | | | To 1 mV | | | 1.5 | | | 1.5 | | |
| $V_n$ | Equivalent input noise voltage | | $f = 10\ Hz$ | 25°C | | 28 | | | 28 | | nV/$\sqrt{Hz}$ |
| | | | $f = 10\ kHz$ | | | 11.6 | | | 11.6 | | |
| $V_{N(PP)}$ | Peak-to-peak equivalent input noise voltage | $R_S = 20\ \Omega$, See Figure 3 | $f = 10\ Hz$ 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/$\sqrt{Hz}$ |
| THD + N | Total harmonic distortion plus noise | $V_{O(PP)} = 20\ V$, $f = 1\ kHz$, $R_S = 25\ \Omega$ | $A_{VD} = 10$, $R_L = 2\ k\Omega$, | 25°C | | 0.008% | | | 0.008% | | |
| $B_1$ | Unity-gain bandwidth | $V_I = 10\ mV$, $C_L = 25\ pF$, | $R_L = 2\ k\Omega$, See Figure 2 | 25°C | 8 | 10 | | 8 | 10 | | MHz |
| $B_{OM}$ | Maximum output-swing bandwidth | $V_{O(PP)} = 20\ V$, $R_L = 2\ k\Omega$, | $A_{VD} = -1$, $C_L = 25\ pF$ | 25°C | 478 | 637 | | 478 | 637 | | kHz |
| $\phi_m$ | Phase margin at unity gain | $V_I = 10\ mV$, $C_L = 25\ pF$, | $R_L = 2\ k\Omega$, See Figure 2 | 25°C | | 57° | | | 57° | | |

† Full range is 0°C to 70°C.

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

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2082I MIN | TLE2082I TYP | TLE2082I MAX | TLE2082AI MIN | TLE2082AI TYP | TLE2082AI MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_{IO}$ | Input offset voltage | $V_{IC}=0$, $V_O=0$, $R_S=50\,\Omega$ | | 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 | $R_S=50\,\Omega$ | | 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 | $I_O=-200\,\mu A$ | | 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 | $I_O=200\,\mu A$ | | 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 | $V_O=\pm 2.3$ V | $R_L=600\,\Omega$ | 25°C | 80 | 91 | | 80 | 91 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| | | | $R_L=2\,k\Omega$ | 25°C | 90 | 100 | | 90 | 100 | | |
| | | | | Full range | 89 | | | 89 | | | |
| | | | $R_L=10\,k\Omega$ | 25°C | 95 | 106 | | 95 | 106 | | |
| | | | | Full range | 94 | | | 94 | | | |
| $r_i$ | Input resistance | $V_{IC}=0$ | | 25°C | | $10^{12}$ | | | $10^{12}$ | | $\Omega$ |
| $c_i$ | 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 | | $\Omega$ |
| CMRR | Common-mode rejection ratio | $V_{IC}=V_{ICR}min$, $V_O=0$, $R_S=50\,\Omega$ | | 25°C | 70 | 89 | | 70 | 89 | | dB |
| | | | | Full range | 68 | | | 68 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm}=\pm 5$ V to $\pm 15$ V, $V_O=0$, $R_S=50\,\Omega$ | | 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.

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**TLE2082I electrical characteristics at specified free-air temperature, $V_{CC\pm} = \pm 5$ 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, $V_{CC\pm} = \pm 5$ V**

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2082I | | | TLE2082AI | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR + | Positive slew rate | $V_{O(PP)} = \pm 2.3$ 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 | | 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 | $R_S = 20$ Ω, See Figure 3 | 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, $V_{CC\pm} = \pm15$ V (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2082I | | | TLE2082AI | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{IC} = 0$, $V_O = 0$, $R_S = 50\ \Omega$ | | 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 | $R_S = 50\ \Omega$ | | 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 | $V_O = \pm10$ V | $R_L = 600\ \Omega$ | 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, $V_O = 0$, $R_S = 50\ \Omega$ | | 25°C | 80 | 98 | | 80 | 98 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm} = \pm5$ V to $\pm15$ V, $V_O = 0$, $R_S = 50\ \Omega$ | | 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, $V_{CC\pm}$ = $\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 | $V_{IC} = 0$, | $R_L = 2$ k$\Omega$ | 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, $V_{CC\pm}$ = $\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, $A_{VD} = -1$, $R_L = 2$ k$\Omega$, $C_L = 100$ pF, See Figure 1 | | 25°C | 28 | 40 | | 28 | 40 | | V/$\mu$s |
| | | | | Full range | 22 | | | 22 | | | |
| SR − | Negative slew rate | | | 25°C | 30 | 45 | | 30 | 45 | | V/$\mu$s |
| | | | | Full range | 22 | | | 22 | | | |
| $t_S$ | Settling time | $A_{VD} = -1$, 10-V step, $R_L = 1$ k$\Omega$, $C_L = 100$ pF | To 10 mV | 25°C | | 0.4 | | | 0.4 | | $\mu$s |
| | | | To 1 mV | | | 1.5 | | | 1.5 | | |
| $V_n$ | Equivalent input noise voltage | | f = 10 Hz | 25°C | | 28 | | | 28 | | nV/$\sqrt{\text{Hz}}$ |
| | | | f = 10 kHz | | | 11.6 | | | 11.6 | | |
| $V_{N(PP)}$ | Peak-to-peak equivalent input noise voltage | $R_S = 20$ $\Omega$, See Figure 3 | f = 10 Hz to 10 kHz | 25°C | | 6 | | | 6 | | $\mu$V |
| | | | 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/$\sqrt{\text{Hz}}$ |
| THD + N | Total harmonic distortion plus noise | $V_{O(PP)} = 20$ V, $A_{VD} = 10$, f = 1 kHz, $R_L = 2$ k$\Omega$, $R_S = 25$ $\Omega$ | | 25°C | | 0.008% | | | 0.008% | | |
| $B_1$ | Unity-gain bandwidth | $V_I = 10$ mV, $C_L = 25$ pF, $R_L = 2$ k$\Omega$, See Figure 2 | | 25°C | 8 | 10 | | 8 | 10 | | MHz |
| $B_{OM}$ | Maximum output-swing bandwidth | $V_{O(PP)} = 20$ V, $A_{VD} = -1$, $R_L = 2$ k$\Omega$, $C_L = 25$ pF | | 25°C | 478 | 637 | | 478 | 637 | | kHz |
| $\phi_m$ | Phase margin at unity gain | $V_I = 10$ mV, $R_L = 2$ k$\Omega$, $C_L = 25$ pF, See Figure 2 | | 25°C | | 57° | | | 57° | | |

† Full range is −40°C to 85°C.

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

| PARAMETER | | TEST CONDITIONS | | $T_A$[†] | TLE2082M | | | TLE2082AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{IC} = 0$, $V_O = 0$, $R_S = 50\,\Omega$ | | 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 | $R_S = 50\,\Omega$ | | 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 | $I_O = -200\,\mu A$ | | 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 | $I_O = 200\,\mu A$ | | 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 | $V_O = \pm 2.3$ V | $R_L = 600\,\Omega$ | 25°C | 80 | 91 | | 80 | 91 | | dB |
| | | | | Full range | 78 | | | 78 | | | |
| | | | $R_L = 2\,k\Omega$ | 25°C | 90 | 100 | | 90 | 100 | | |
| | | | | Full range | 88 | | | 88 | | | |
| | | | $R_L = 10\,k\Omega$ | 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 | $V_{IC} = V_{ICR}min$, $V_O = 0$, $R_S = 50\,\Omega$ | | 25°C | 70 | 89 | | 70 | 89 | | dB |
| | | | | Full range | 68 | | | 68 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm} = \pm 5$ V to $\pm 15$ V, $V_O = 0$, $R_S = 50\,\Omega$ | | 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, $V_{CC\pm} = \pm5$ 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, $V_{CC\pm} = \pm5$ V

| | PARAMETER | TEST CONDITIONS | | $T_A$† | TLE2082M | | | TLE2082AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR+ | Positive slew rate | $V_{O(PP)} = \pm2.3$ 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 | | 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 | $R_S = 20$ Ω, See Figure 3 | 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.

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

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2082M MIN | TYP | MAX | TLE2082AM MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_{IO}$ | 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, $V_{CC\pm} = \pm15$ 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 | $V_{IC} = 0$, | $R_L = 2$ k$\Omega$ | 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, $V_{CC\pm} = \pm15$ V**

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2082M | | | TLE2082AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR + | Positive slew rate | $V_{O(PP)} = 10$ V, $A_{VD} = -1$, $R_L = 2$ k$\Omega$, $C_L = 100$ pF, See Figure 1 | | 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, $R_L = 1$ k$\Omega$, $C_L = 100$ pF | To 10 mV | 25°C | | 0.4 | | | 0.4 | | µs |
| | | | To 1 mV | | | 1.5 | | | 1.5 | | |
| $V_n$ | Equivalent input noise voltage | $R_S = 20$ $\Omega$, 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, $R_L = 2$ k$\Omega$, $R_S = 25$ $\Omega$ | | 25°C | | 0.008% | | | 0.008% | | |
| $B_1$ | Unity-gain bandwidth | $V_I = 10$ mV, $C_L = 25$ pF, $R_L = 2$ k$\Omega$, See Figure 2 | | 25°C | 8* | 10 | | 8* | 10 | | MHz |
| $B_{OM}$ | Maximum output-swing bandwidth | $V_{O(PP)} = 20$ V, $A_{VD} = -1$, $R_L = 2$ k$\Omega$, $C_L = 25$ pF | | 25°C | 478* | 637 | | 478* | 637 | | kHz |
| $\phi_m$ | Phase margin at unity gain | $V_I = 10$ mV, $R_L = 2$ k$\Omega$, $C_L = 25$ pF, 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.

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## TLE2082Y electrical characteristics at $V_{CC\pm} = \pm15$ V, $T_A = 25°C$

| PARAMETER | | TEST CONDITIONS | | TLE2082Y MIN | TLE2082Y TYP | TLE2082Y MAX | UNIT |
|---|---|---|---|---|---|---|---|
| $V_{IO}$ | Input offset voltage | $V_{IC} = 0$, $V_O = 0$, $R_S = 50\ \Omega$ | | | 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 | $R_S = 50\ \Omega$ | | 15 to $-11$ | 15 to 11.9 | | V |
| $V_{OM+}$ | Maximum positive peak output voltage swing | $I_O = -200\ \mu A$ | | 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 | $I_O = 200\ \mu A$ | | $-13.8$ | $-14.2$ | | V |
| | | $I_O = 2$ mA | | $-13.5$ | $-14$ | | |
| | | $I_O = 20$ mA | | $-11.5$ | $-12.4$ | | |
| $A_{VD}$ | Large-signal differential voltage amplification | $V_O = \pm 10$ V | $R_L = 600\ \Omega$ | 80 | 96 | | dB |
| | | | $R_L = 2\ k\Omega$ | 90 | 109 | | |
| | | | $R_L = 10\ k\Omega$ | 95 | 118 | | |
| $r_i$ | Input resistance | $V_{IC} = 0$ | | | $10^{12}$ | | $\Omega$ |
| $c_i$ | 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 | | $\Omega$ |
| CMRR | Common-mode rejection ratio | $V_{IC} = V_{ICR}$min, $V_O = 0$, $R_S = 50\ \Omega$ | | 80 | 98 | | dB |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm} = \pm5$ V to $\pm15$ V, $V_O = 0$, $R_S = 50\ \Omega$ | | 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 | | |

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## TLE2084C electrical characteristics at specified free-air temperature, $V_{CC\pm} = \pm5$ V (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2084C MIN | TLE2084C TYP | TLE2084C MAX | TLE2084AC MIN | TLE2084AC TYP | TLE2084AC MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_{IO}$ | Input offset voltage | $V_{IC} = 0$, $V_O = 0$, $R_S = 50\ \Omega$ | | 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 | $R_S = 50\ \Omega$ | | 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 | $I_O = -200\ \mu A$ | | 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 | $I_O = 200\ \mu A$ | | 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 | $V_O = \pm 2.3$ V | $R_L = 600\ \Omega$ | 25°C | 80 | 91 | | 80 | 91 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| | | | $R_L = 2\ k\Omega$ | 25°C | 90 | 100 | | 90 | 100 | | |
| | | | | Full range | 89 | | | 89 | | | |
| | | | $R_L = 10\ k\Omega$ | 25°C | 95 | 106 | | 95 | 106 | | |
| | | | | Full range | 94 | | | 94 | | | |
| $r_i$ | Input resistance | $V_{IC} = 0$ | | 25°C | | $10^{12}$ | | | $10^{12}$ | | $\Omega$ |
| $c_i$ | 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 | | $\Omega$ |
| CMRR | Common-mode rejection ratio | $V_{IC} = V_{ICR}min$, $V_O = 0$, $R_S = 50\ \Omega$ | | 25°C | 70 | 89 | | 70 | 89 | | dB |
| | | | | Full range | 68 | | | 68 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm} / \Delta V_{IO}$) | $V_{CC\pm} = \pm5$ V to $\pm15$ V, $V_O = 0$, $R_S = 50\ \Omega$ | | 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 | $V_{IC} = 0$, $R_L = 2\ k\Omega$ | | 25°C | | 120 | | | 120 | | dB |

† Full range is 0°C to 70°C.

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

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2084C | | | TLE2084AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR + | Positive slew rate | $V_{O(PP)} = \pm 2.3$ 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, $f = 1$ 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, $V_{CC\pm} = \pm15$ V (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2084C MIN | TLE2084C TYP | TLE2084C MAX | TLE2084AC MIN | TLE2084AC TYP | TLE2084AC MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_{IO}$ | Input offset voltage | $V_{IC} = 0$, $V_O = 0$, $R_S = 50\ \Omega$ | | 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 | $R_S = 50\ \Omega$ | | 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 | $I_O = -200\ \mu A$ | | 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 | $I_O = 200\ \mu A$ | | 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 | $V_O = \pm 10$ V | $R_L = 600\ \Omega$ | 25°C | 80 | 96 | | 80 | 96 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| | | | $R_L = 2\ k\Omega$ | 25°C | 90 | 109 | | 90 | 109 | | |
| | | | | Full range | 89 | | | 89 | | | |
| | | | $R_L = 10\ k\Omega$ | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | | Full range | 94 | | | 94 | | | |
| $r_i$ | Input resistance | $V_{IC} = 0$ | | 25°C | | $10^{12}$ | | | $10^{12}$ | | $\Omega$ |
| $c_i$ | 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 | | $\Omega$ |
| CMRR | Common-mode rejection ratio | $V_{IC} = V_{ICR}min$, $V_O = 0$, $R_S = 50\ \Omega$ | | 25°C | 80 | 98 | | 80 | 98 | | dB |
| | | | | Full range | 79 | | | 79 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm} = \pm5$ V to $\pm15$ V, $V_O = 0$, $R_S = 50\ \Omega$ | | 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 | $V_{IC} = 0$, $R_L = 2\ k\Omega$ | | 25°C | | 120 | | | 120 | | dB |

† Full range is 0°C to 70°C.

## TLE2084C electrical characteristics at specified free-air temperature, $V_{CC\pm} = \pm15$ 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, $V_{CC\pm} = \pm15$ 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 | | 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 | $R_S = 20$ Ω, See Figure 3 | 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, $V_{CC\pm} = \pm 5$ V (unless otherwise noted)**

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2084M MIN | TLE2084M TYP | TLE2084M MAX | TLE2084AM MIN | TLE2084AM TYP | TLE2084AM MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_{IO}$ | Input offset voltage | $V_{IC} = 0$, $V_O = 0$, $R_S = 50\ \Omega$ | | 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 | $R_S = 50\ \Omega$ | | 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 | $I_O = -200\ \mu A$ | | 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 | $I_O = 200\ \mu A$ | | 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 | $V_O = \pm 2.3$ V | $R_L = 600\ \Omega$ | 25°C | 80 | 91 | | 80 | 91 | | dB |
| | | | | Full range | 78 | | | 78 | | | |
| | | | $R_L = 2\ k\Omega$ | 25°C | 90 | 100 | | 90 | 100 | | |
| | | | | Full range | 88 | | | 88 | | | |
| | | | $R_L = 10\ k\Omega$ | 25°C | 95 | 106 | | 95 | 106 | | |
| | | | | Full range | 93 | | | 93 | | | |
| $r_i$ | Input resistance | $V_{IC} = 0$ | | 25°C | | $10^{12}$ | | | $10^{12}$ | | $\Omega$ |
| $c_i$ | 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 | | $\Omega$ |
| CMRR | Common-mode rejection ratio | $V_{IC} = V_{ICR}$min, $V_O = 0$, $R_S = 50\ \Omega$ | | 25°C | 70 | 89 | | 70 | 89 | | dB |
| | | | | Full range | 68 | | | 68 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm} = \pm 5$ V to $\pm 15$ V, $V_O = 0$, $R_S = 50\ \Omega$ | | 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 | $V_{IC} = 0$, $R_L = 2\ k\Omega$ | | 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, $V_{CC\pm} = \pm 5$ 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, $V_{CC\pm} = \pm 5$ V

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2084M | | | TLE2084AM | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR+ | Positive slew rate | $V_{O(PP)} = \pm 2.3$ 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 | | 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 | $R_S = 20$ Ω, See Figure 3 | 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.

TEXAS
INSTRUMENTS

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**TLE2084M electrical characteristics at specified free-air temperature, $V_{CC\pm} = \pm15$ V (unless otherwise noted)**

| PARAMETER | | TEST CONDITIONS | | $T_A$† | TLE2084M MIN | TYP | MAX | TLE2084AM MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_{IO}$ | Input offset voltage | $V_{IC} = 0$, $V_O = 0$, $R_S = 50\ \Omega$ | | 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 | $R_S = 50\ \Omega$ | | 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 | $I_O = -200\ \mu A$ | | 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 | $I_O = 200\ \mu A$ | | 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 | $V_O = \pm10$ V | $R_L = 600\ \Omega$ | 25°C | 80 | 96 | | 80 | 96 | | dB |
| | | | | Full range | 78 | | | 78 | | | |
| | | | $R_L = 2\ k\Omega$ | 25°C | 90 | 109 | | 90 | 109 | | |
| | | | | Full range | 88 | | | 88 | | | |
| | | | $R_L = 10\ k\Omega$ | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | | Full range | 93 | | | 93 | | | |
| $r_i$ | Input resistance | $V_{IC} = 0$ | | 25°C | | $10^{12}$ | | | $10^{12}$ | | $\Omega$ |
| $c_i$ | 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 | | $\Omega$ |
| CMRR | Common-mode rejection ratio | $V_{IC} = V_{ICR}min$, $V_O = 0$, $R_S = 50\ \Omega$ | | 25°C | 80 | 98 | | 80 | 98 | | dB |
| | | | | Full range | 78 | | | 78 | | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm} = \pm5$ V to $\pm15$ V, $V_O = 0$, $R_S = 50\ \Omega$ | | 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 | $V_{IC} = 0$, $R_L = 2\ k\Omega$ | | 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, $V_{CC\pm} = \pm15$ 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, $V_{CC\pm} = \pm15$ 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, $R_L = 1$ 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 | | 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 | $R_S = 20$ Ω, See Figure 3 | 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.

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## TLE2084Y electrical characteristics at $V_{CC\pm} = \pm15$ V, $T_A = 25°C$ (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | TLE2084Y MIN | TLE2084Y TYP | TLE2084Y MAX | UNIT |
|---|---|---|---|---|---|---|---|
| $V_{IO}$ | Input offset voltage | $V_{IC} = 0$, $V_O = 0$, $R_S = 50\ \Omega$ | | | | 7 | mV |
| $I_{IO}$ | Input offset current | $V_{IC} = 0$, $V_O = 0$, | | | 15 | 100 | pA |
| $I_{IB}$ | Input bias current | See Figure 4 | | | 25 | 175 | pA |
| $V_{ICR}$ | Common-mode input voltage range | $R_S = 50\ \Omega$ | | 15 to −11 | 15 to 11.9 | | V |
| $V_{OM+}$ | Maximum positive peak output voltage swing | $I_O = -200\ \mu A$ | | 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 | $I_O = 200\ \mu A$ | | −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 | $V_O = \pm 10$ V | $R_L = 600\ \Omega$ | 80 | 96 | | dB |
| | | | $R_L = 2\ k\Omega$ | 90 | 109 | | |
| | | | $R_L = 10\ k\Omega$ | 95 | 118 | | |
| $r_i$ | Input resistance | $V_{IC} = 0$ | | | $10^{12}$ | | $\Omega$ |
| $c_i$ | 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 | | $\Omega$ |
| CMRR | Common-mode rejection ratio | $V_{IC} = V_{ICR}min$, $V_O = 0$, $R_S = 50\ \Omega$ | | 80 | 98 | | dB |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm} = \pm5$ V to $\pm15$ V, $V_O = 0$, $R_S = 50\ \Omega$ | | 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
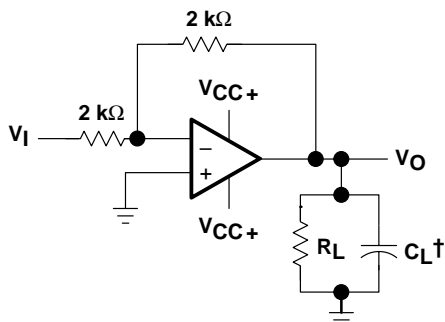
† Includes fixture capacitance

**Figure 1. Slew-Rate Test Circuit**
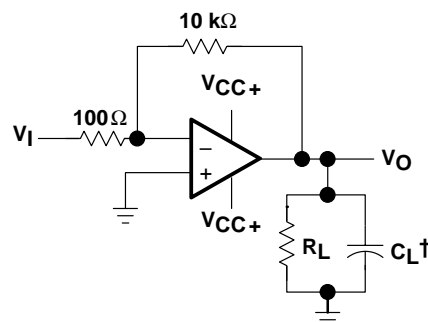
† Includes fixture capacitance

**Figure 2. Unity-Gain Bandwidth
and Phase-Margin Test Circuit**
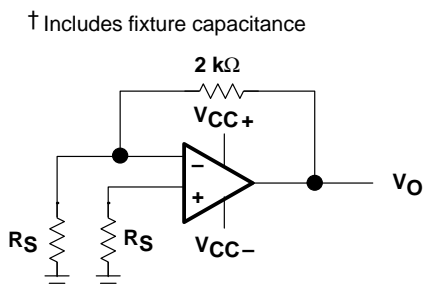
† Includes fixture capacitance

**Figure 3. Noise-Voltage Test Circuit**
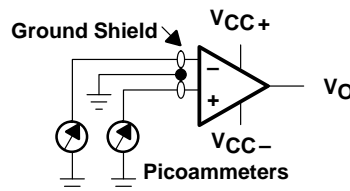
**Figure 4. Input-Bias and Offset-
Current Test Circuit**
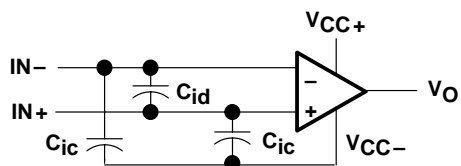
**Figure 5. Internal Input Capacitance**

## 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 |

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## 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**
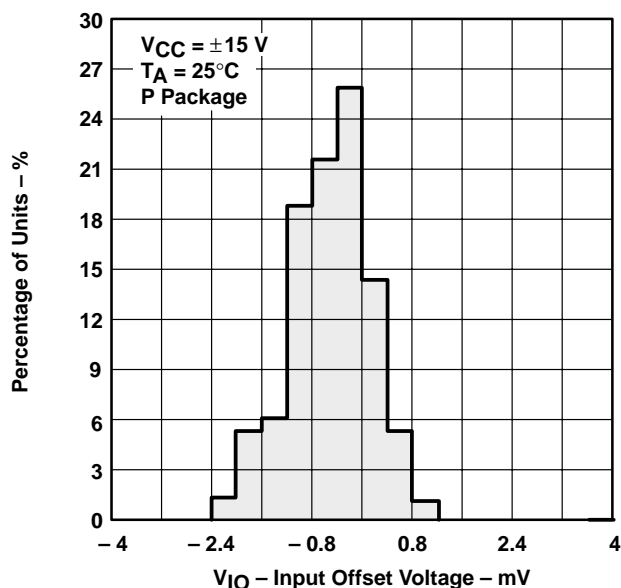


**Figure 6**

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



**Figure 7**

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POST OFFICE BOX 655303 ● DALLAS, TEXAS 75265
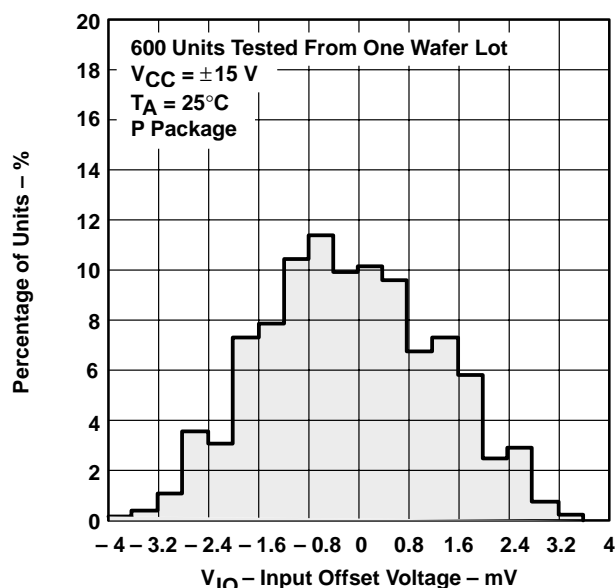
## TYPICAL CHARACTERISTICS

**DISTRIBUTION OF TLE2084**
**INPUT OFFSET VOLTAGE**



$V_{CC\pm} = \pm15$ V
$T_A = 25°C$
N Package
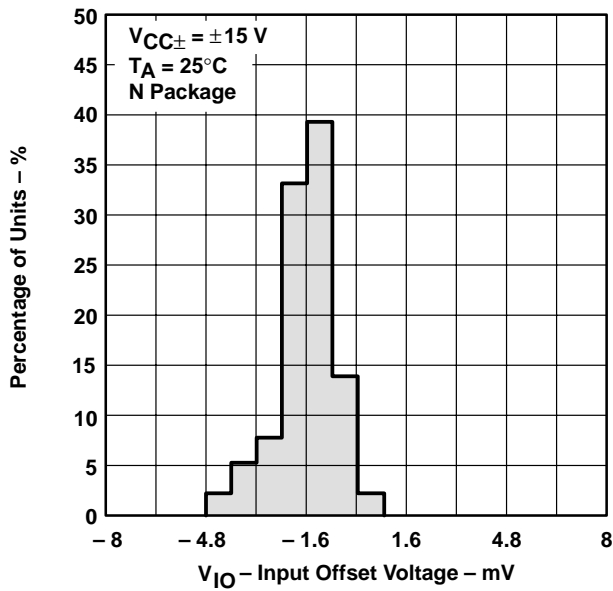
**Figure 8**

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



$V_{CC} = \pm15$ V
$T_A = -55 °C$ to $125°C$
P Package
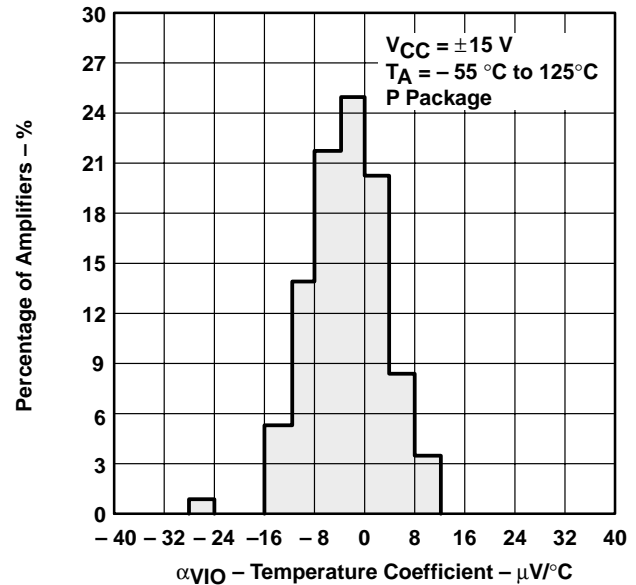
**Figure 9**

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



310 Amplifiers
$V_{CC} = \pm15$ V
$T_A = -55°C$ to $125°C$
P Package
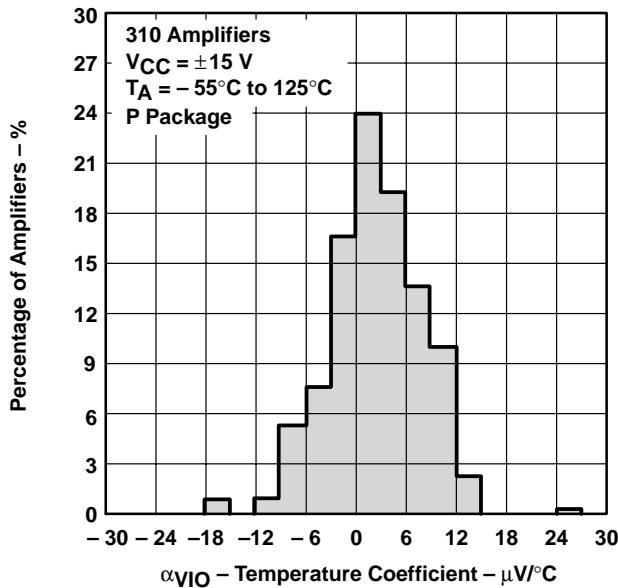
**Figure 10**

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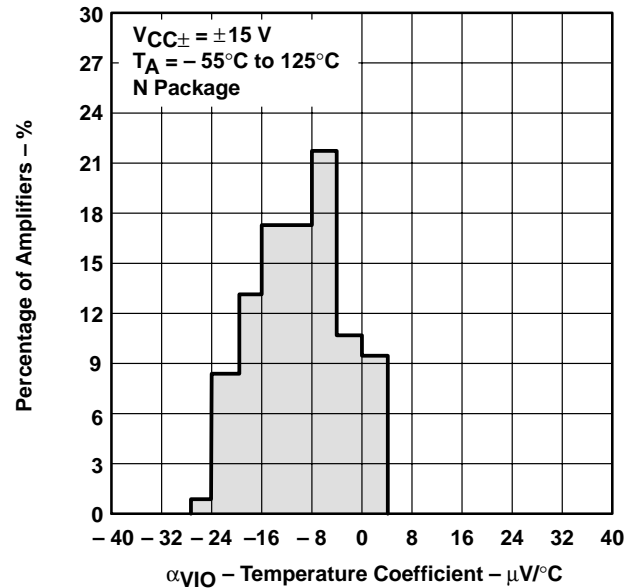


$V_{CC\pm} = \pm15$ V
$T_A = -55 °C$ to $125°C$
N Package

**Figure 11**

**TYPICAL CHARACTERISTICS†**

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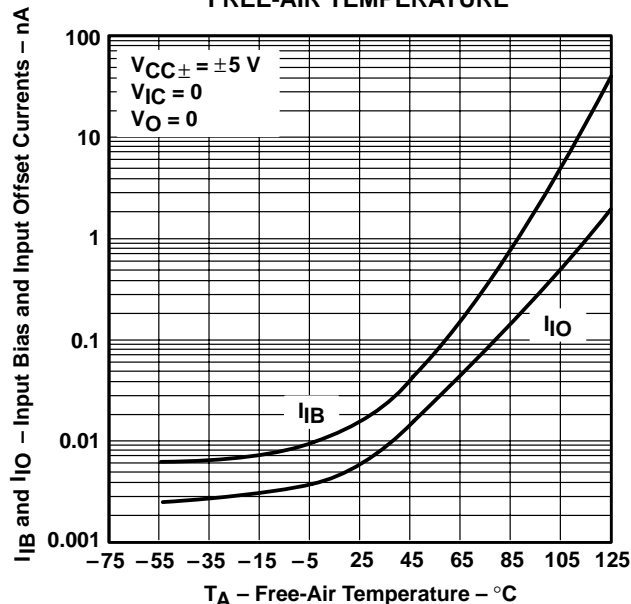


Figure 12

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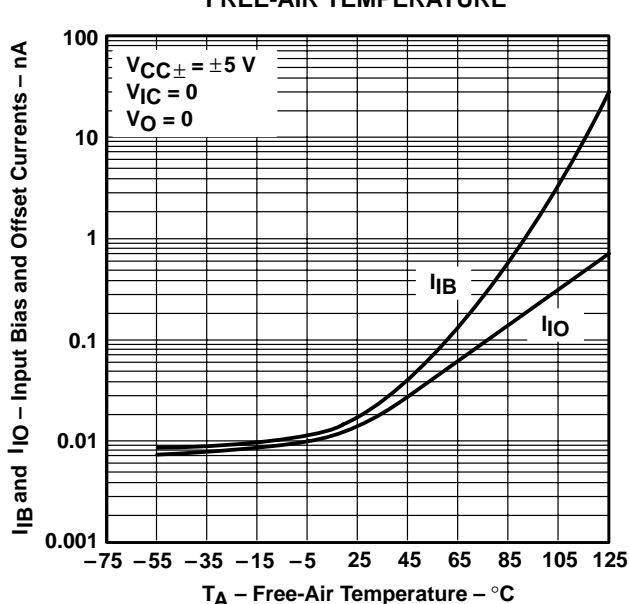


Figure 13

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



Figure 14

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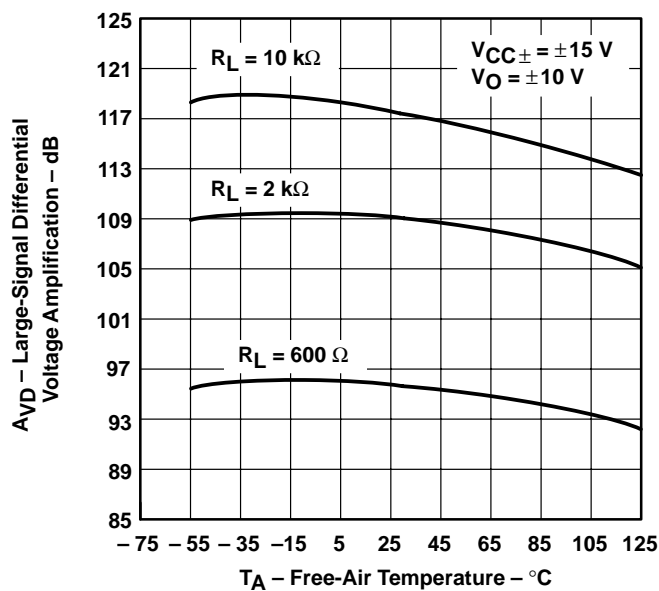**vs**
**FREE-AIR TEMPERATURE**
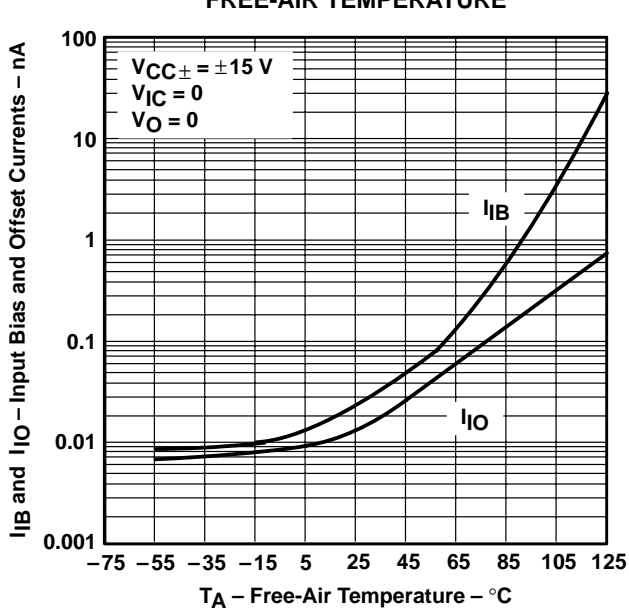


Figure 15

† 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.

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## TYPICAL CHARACTERISTICS†
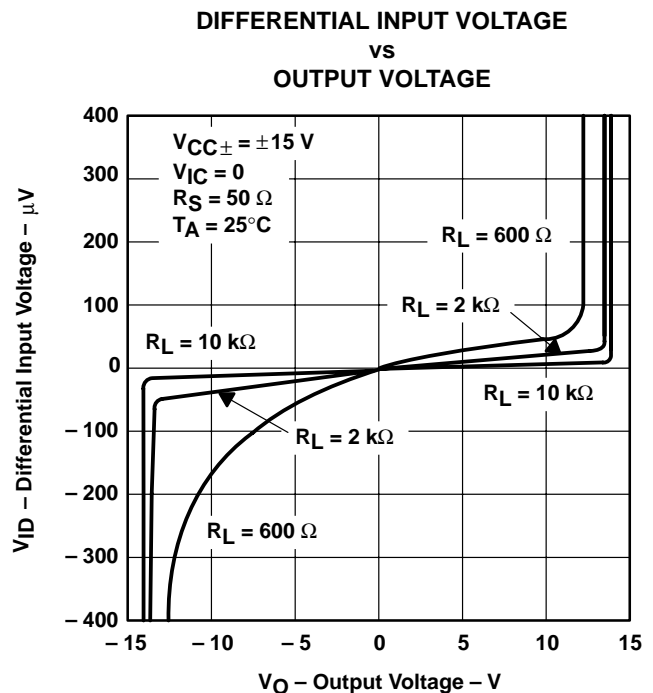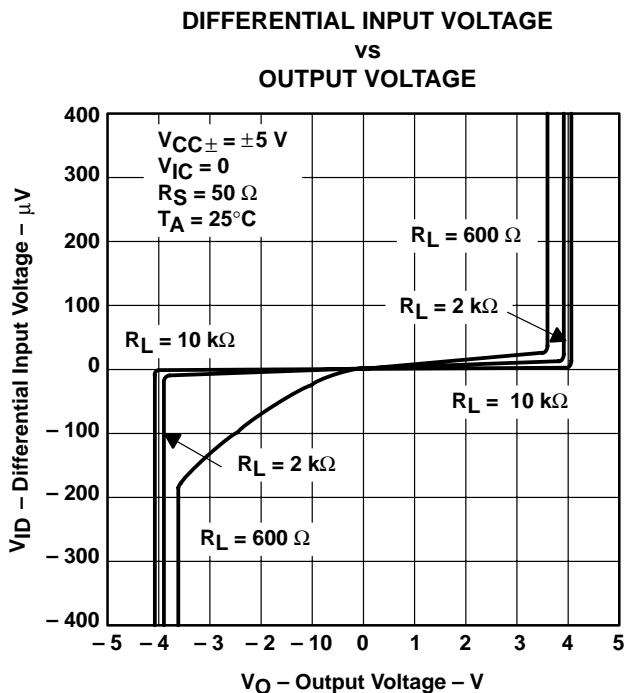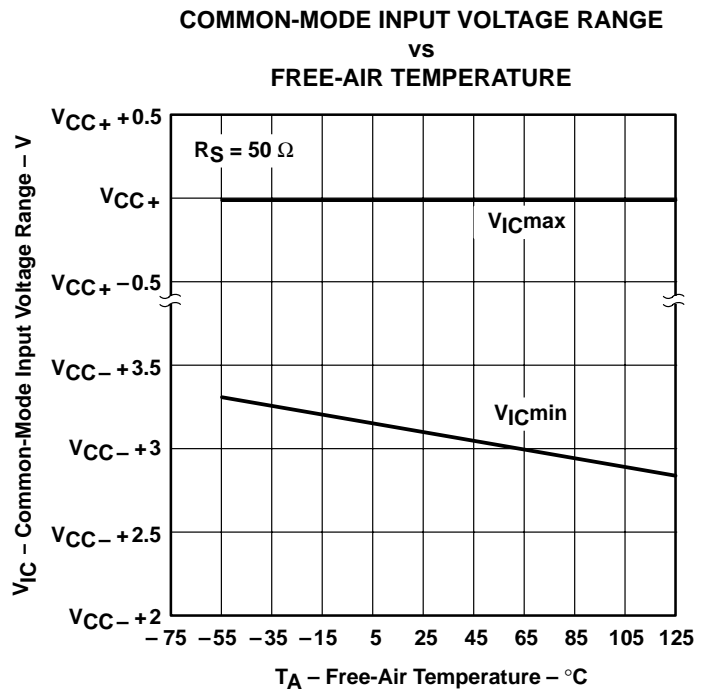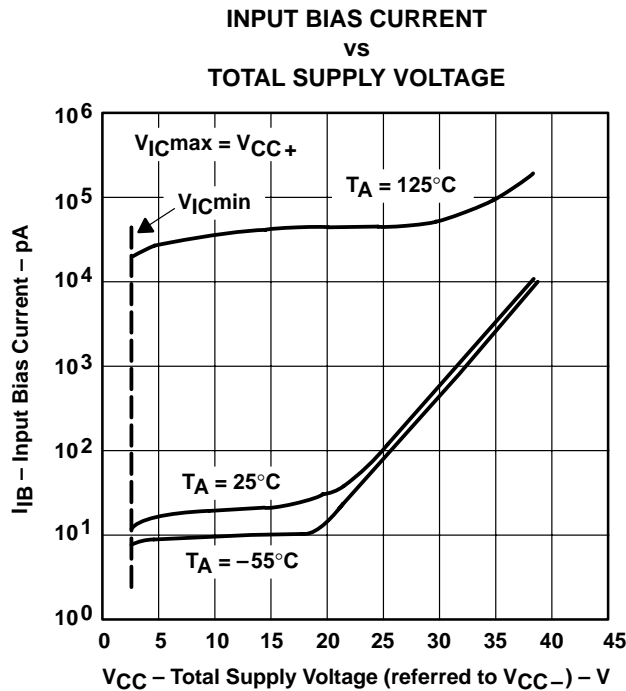
**TLE2081 AND TLE2082**
**MAXIMUM POSITIVE PEAK OUTPUT VOLTAGE**
**vs**
**OUTPUT CURRENT**
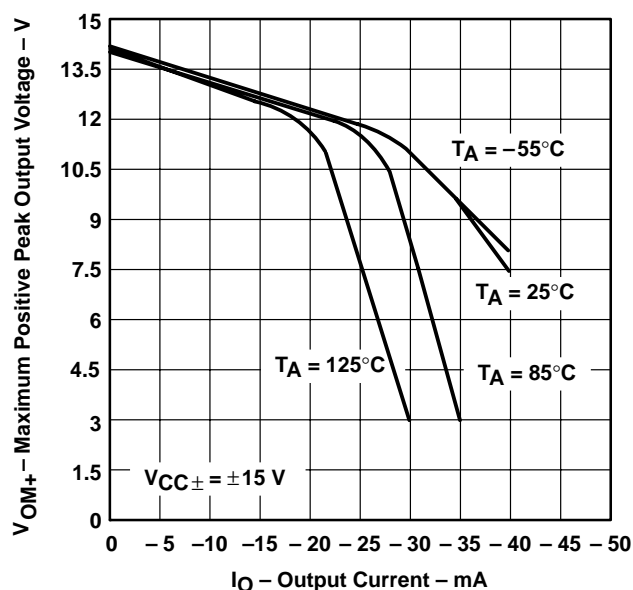


**Figure 20**

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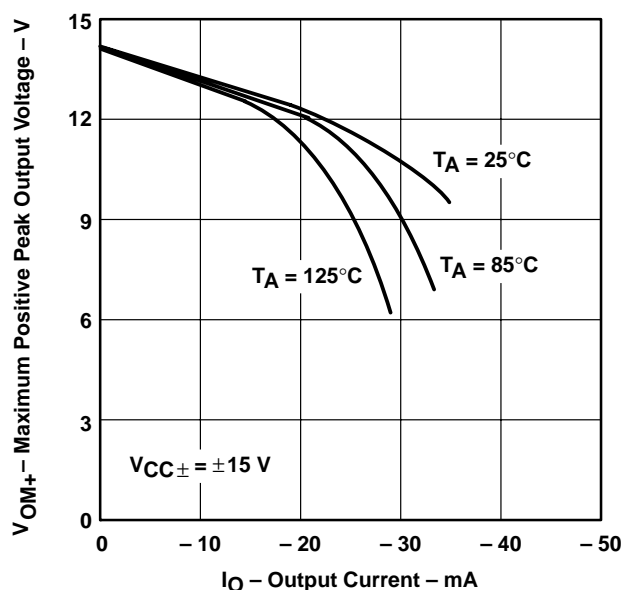


**Figure 21**

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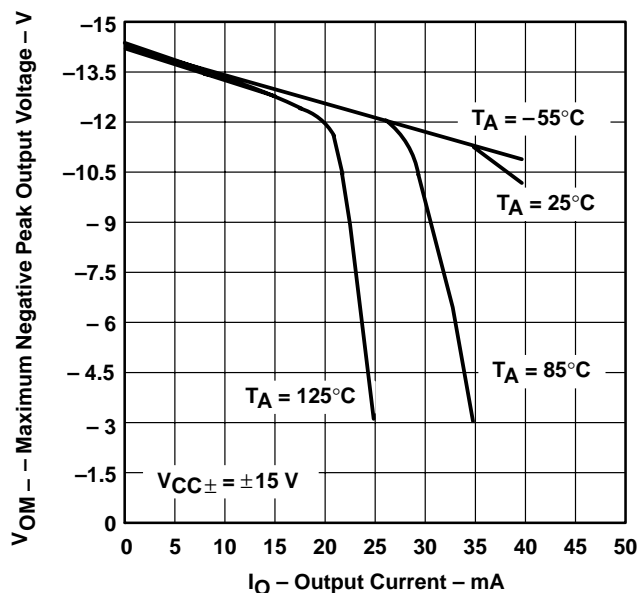


**Figure 22**

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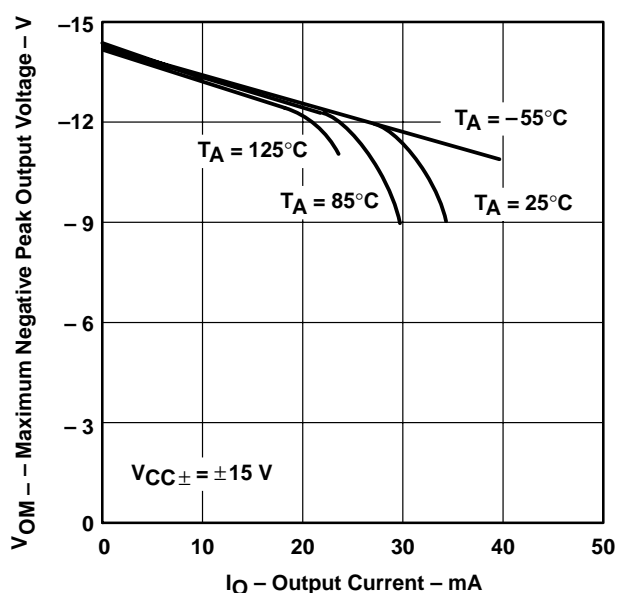


**Figure 23**

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

![Texas Instruments logo]
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## 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
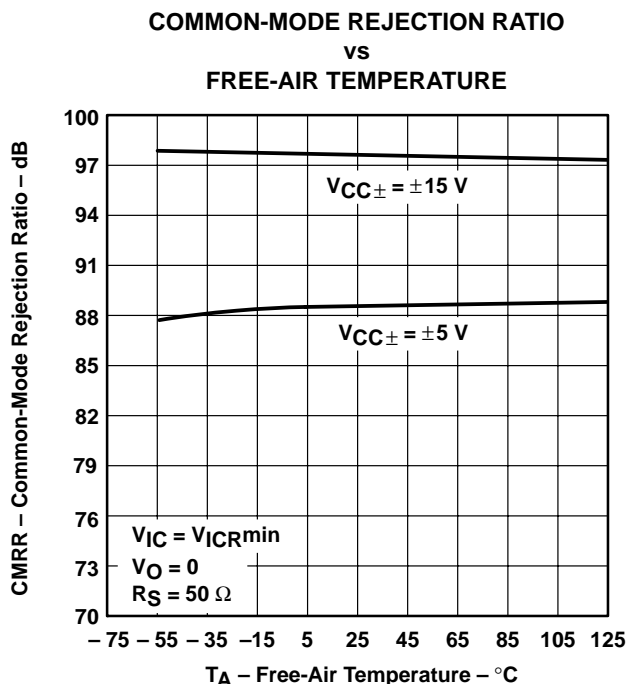


**Figure 26**
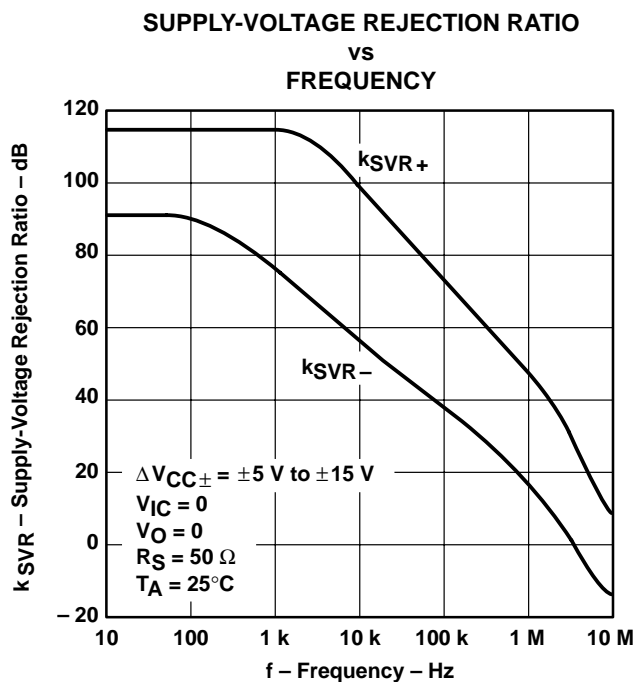
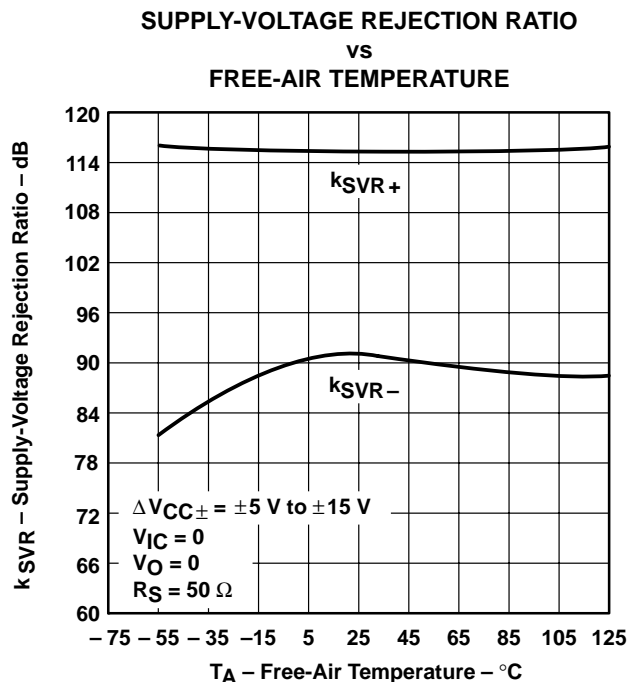### MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE vs FREQUENCY
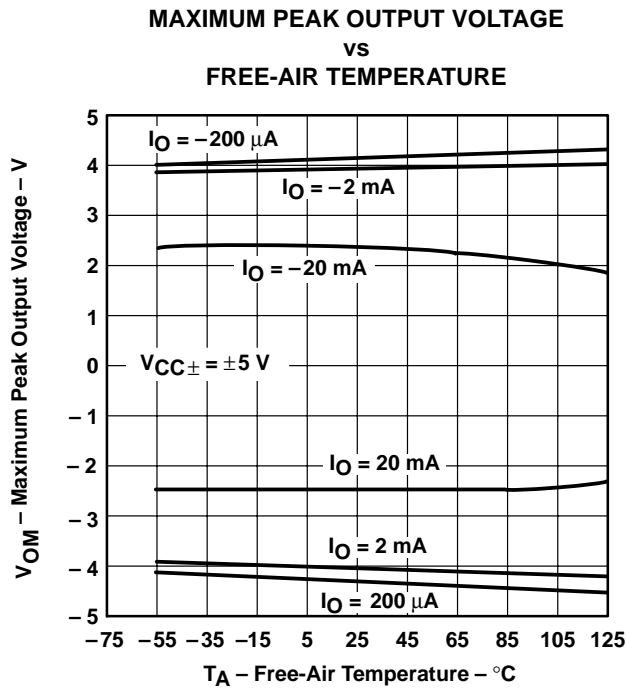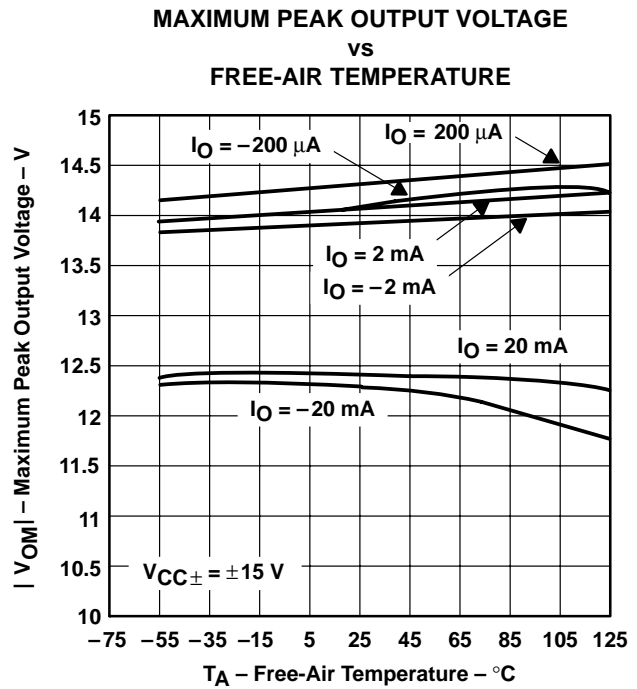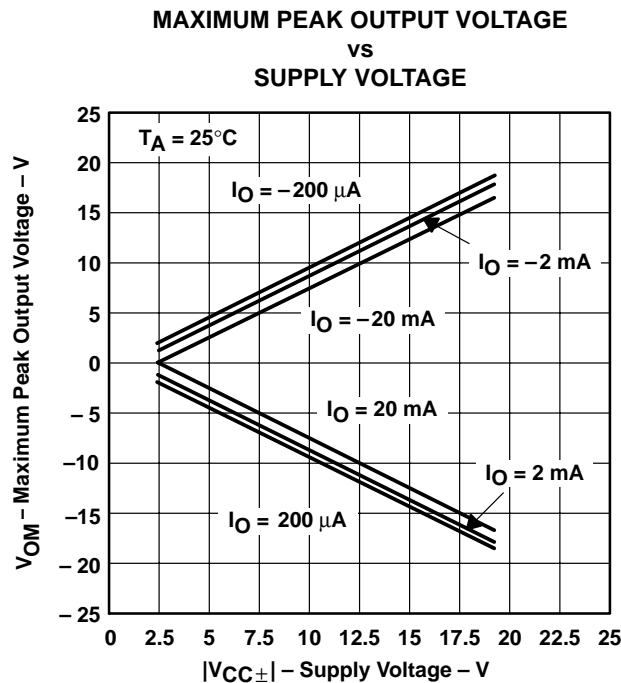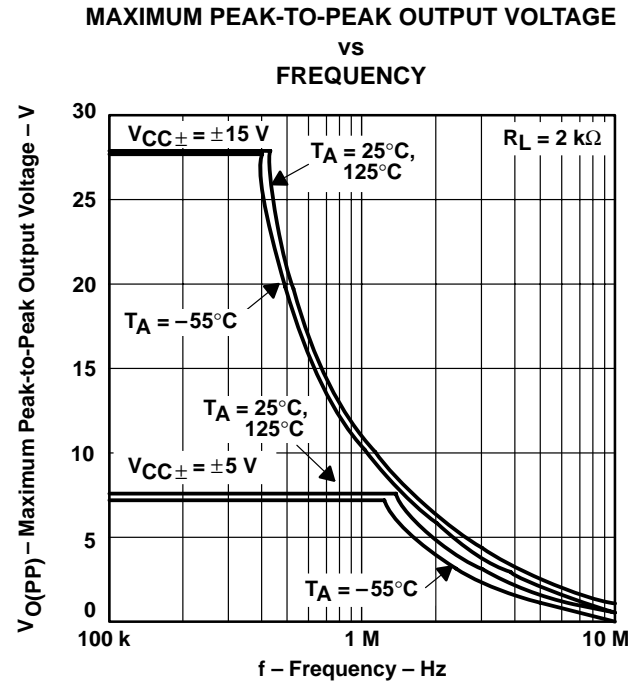


**Figure 27**

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

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## TYPICAL CHARACTERISTICS†

**OUTPUT VOLTAGE**
**vs**
**SETTLING TIME**
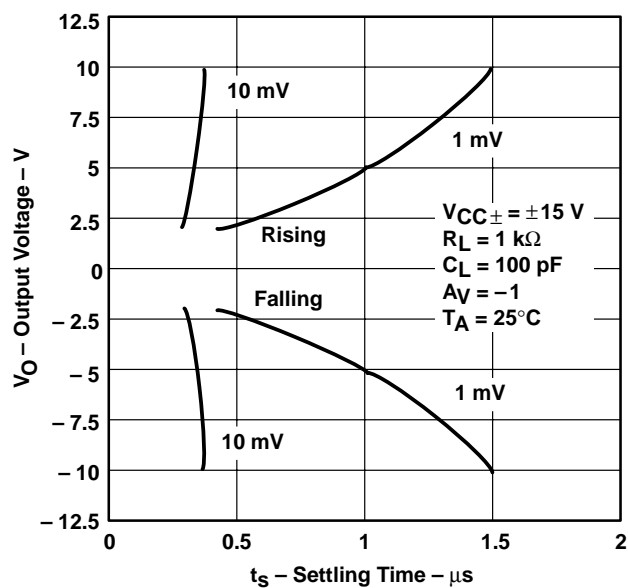


**Figure 28**

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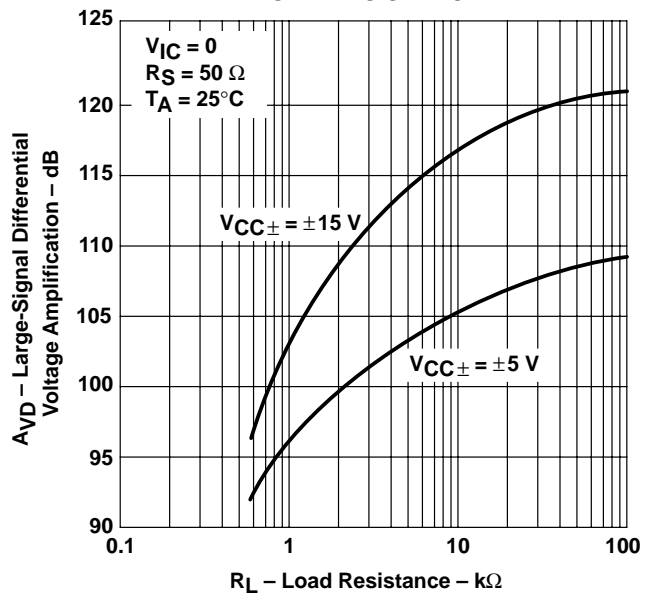


**Figure 29**

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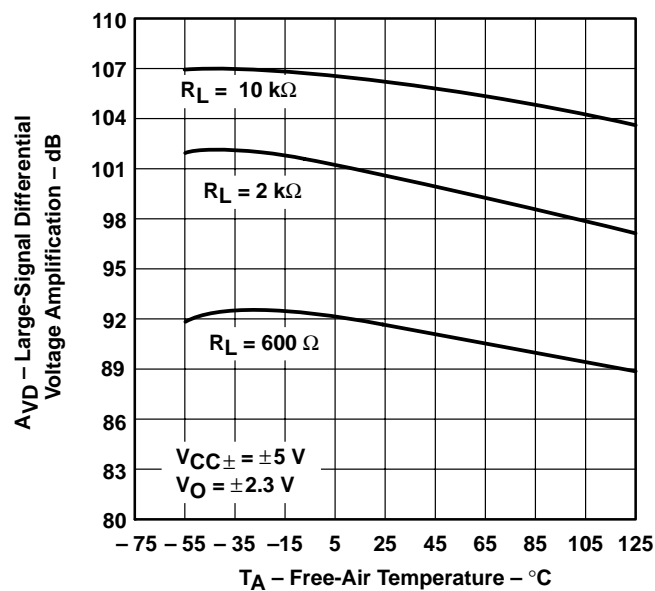


**Figure 30**

**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.

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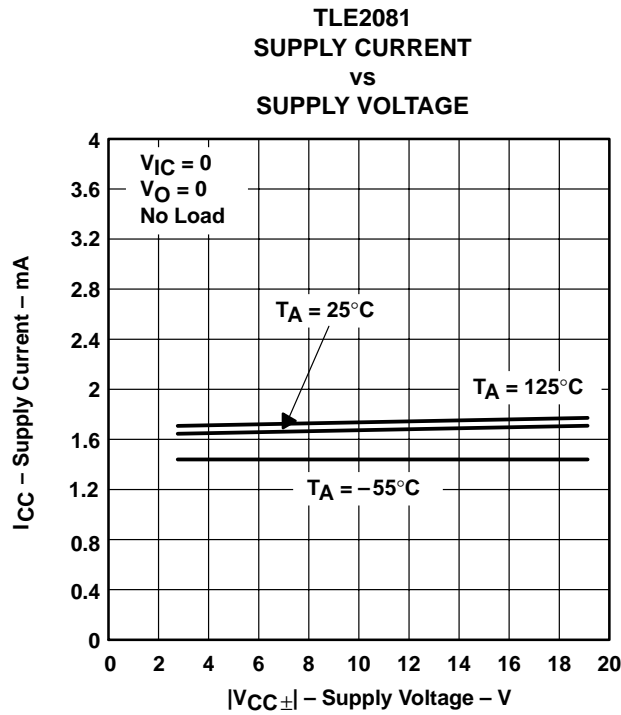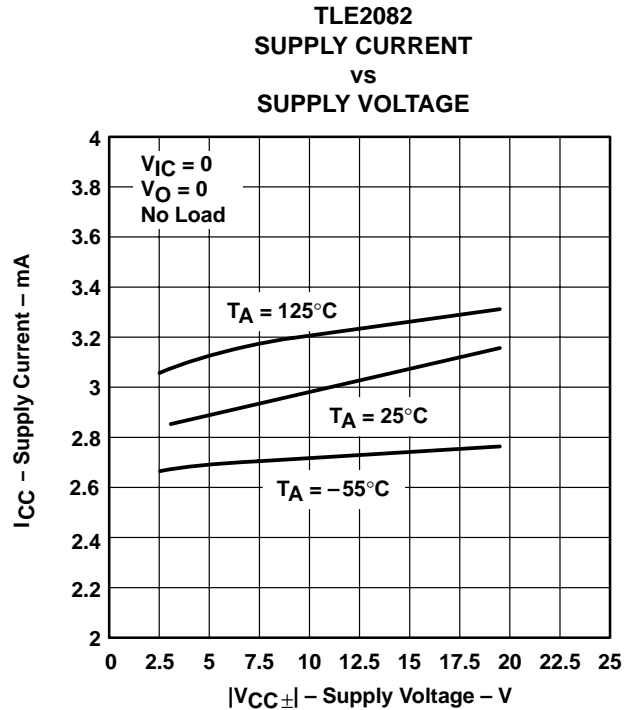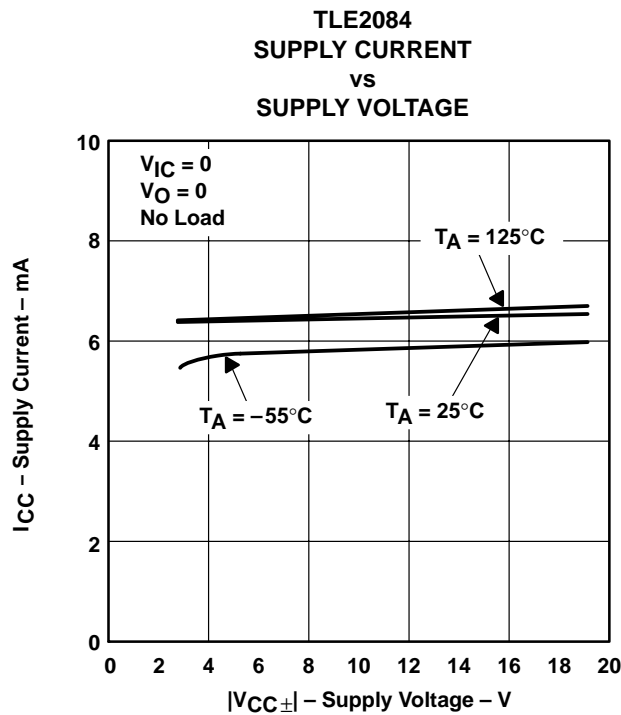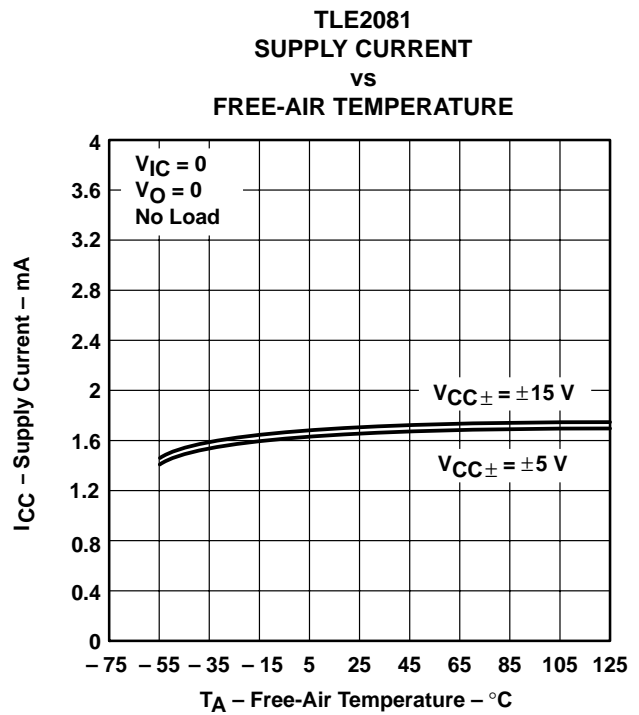
## TYPICAL CHARACTERISTICS

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



$V_{CC\pm} = \pm 15$ V
$R_L = 2$ k$\Omega$
$C_L = 100$ pF
$T_A = 25°C$
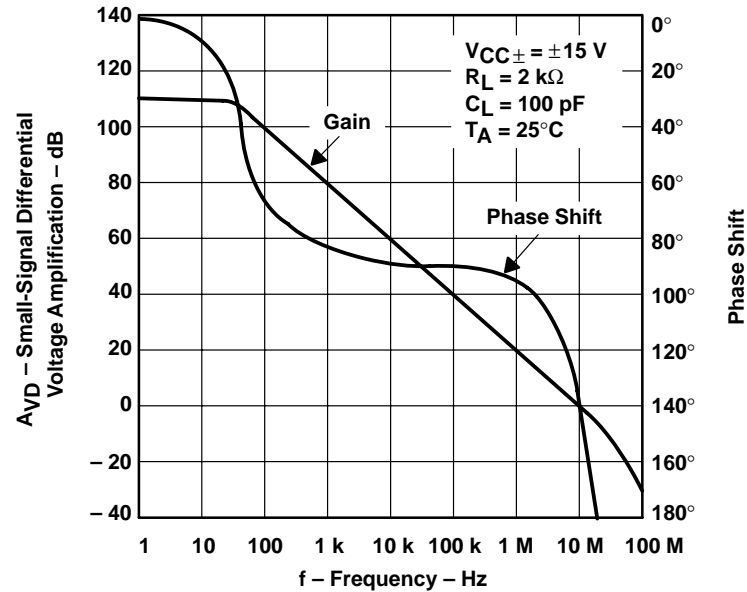
**Figure 32**

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



$V_{CC\pm} = \pm 15$ V
$V_{IC} = 0$
$R_C = 2$ k$\Omega$
$T_A = 25°C$

**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.

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## 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.

**TLE208x, TLE208xA, TLE208xY**
**EXCALIBUR HIGH-SPEED JFET-INPUT**
**OPERATIONAL AMPLIFIERS**
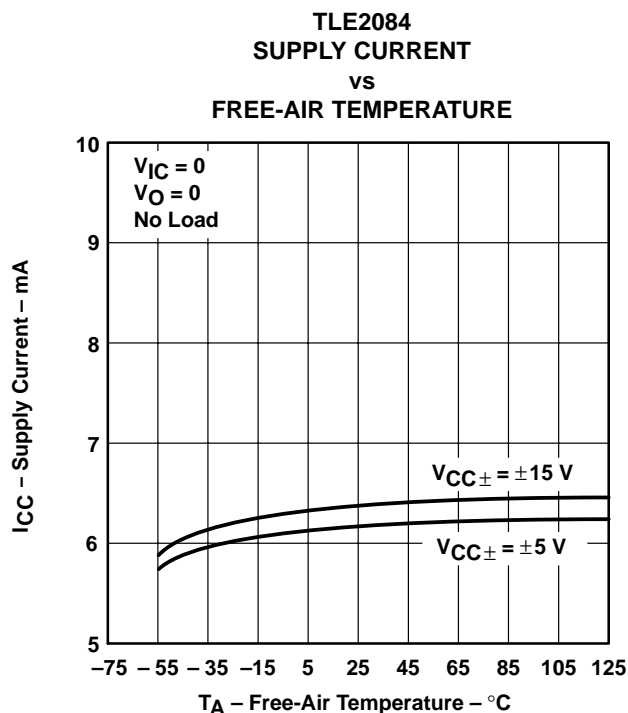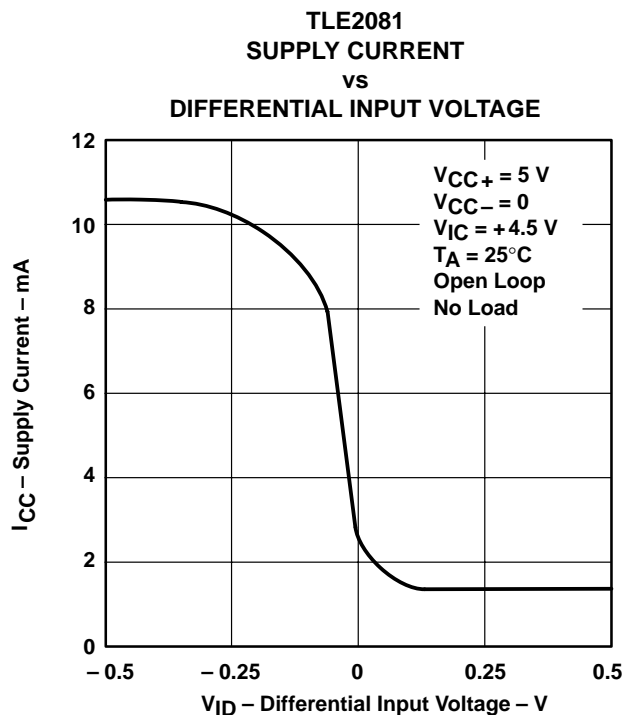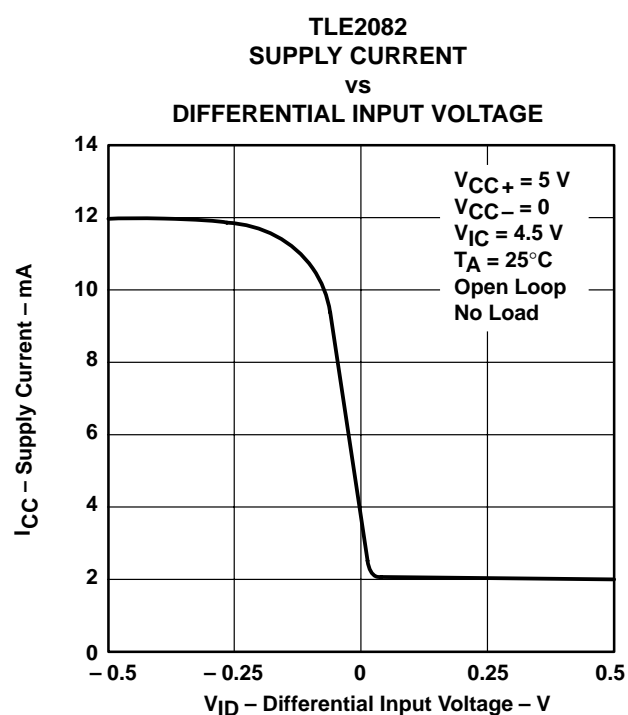SLOS182B – FEBRUARY 1997 – REVISED JUNE 2001

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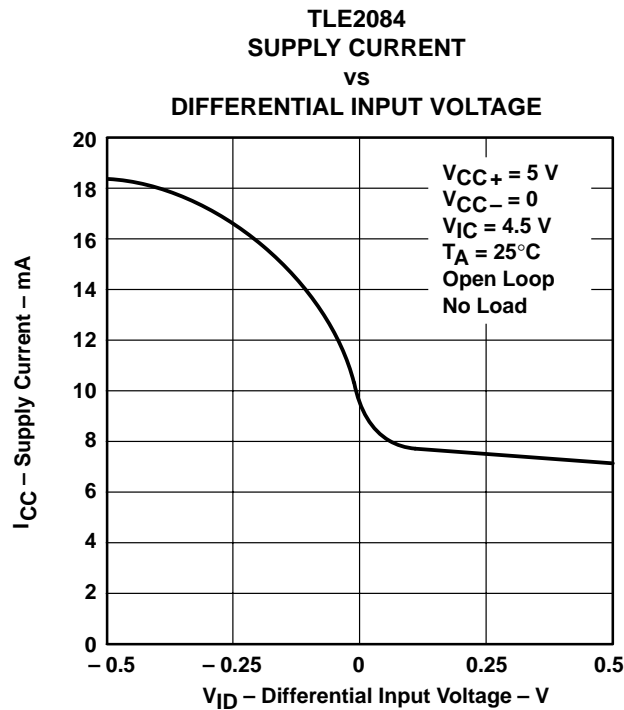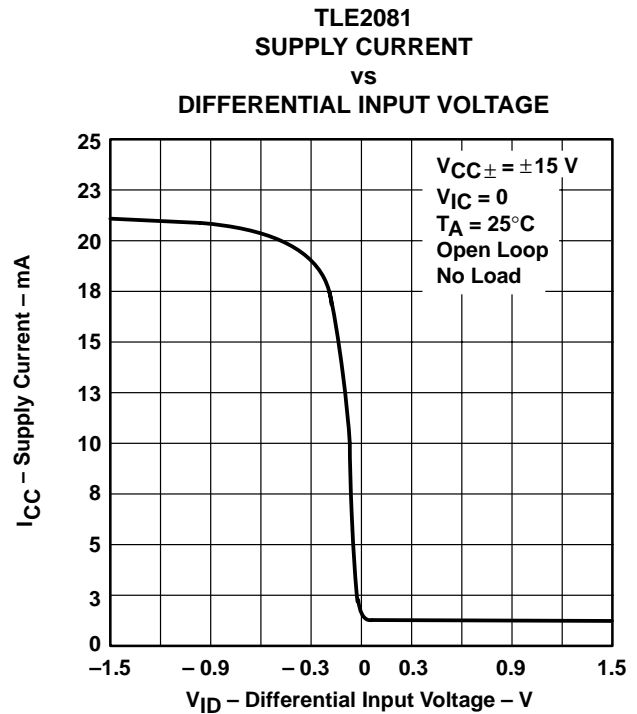**SUPPLY CURRENT**
**vs**
**DIFFERENTIAL INPUT VOLTAGE**
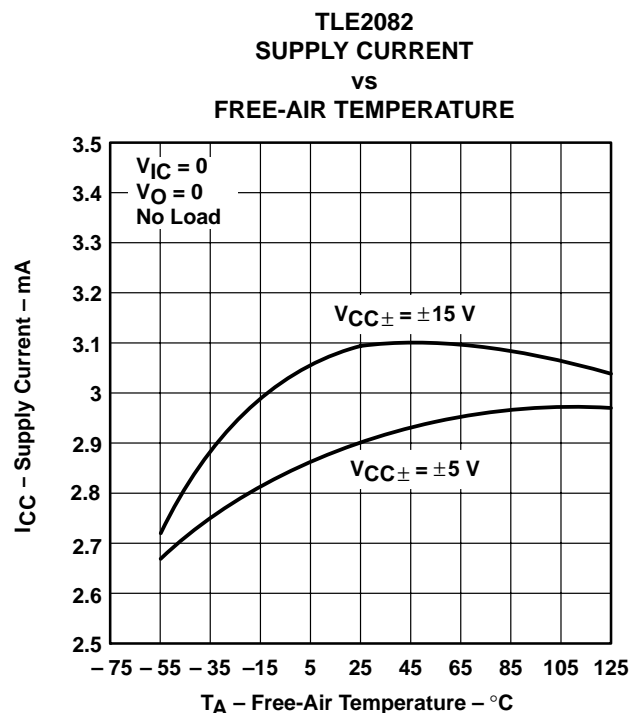


Figure 45

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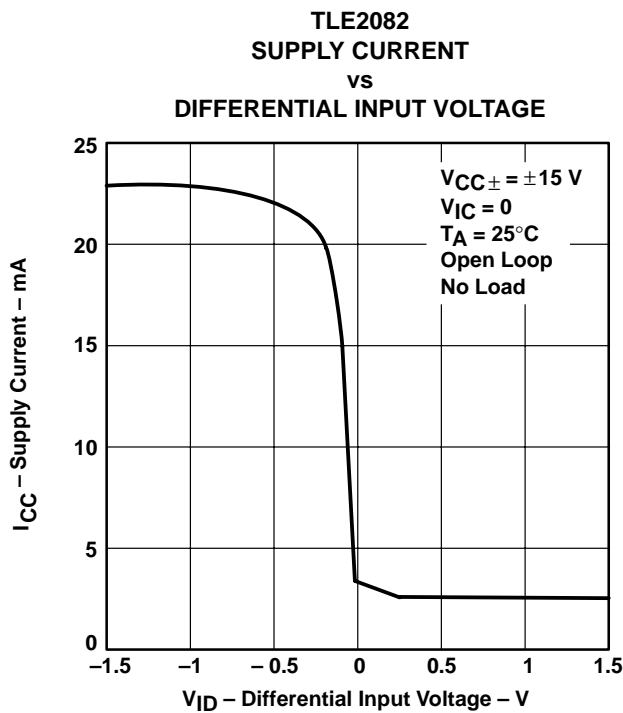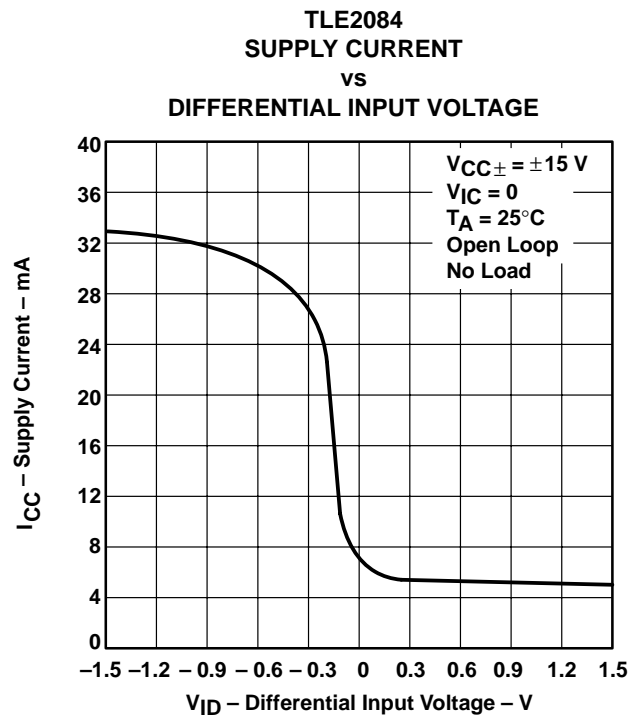
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## TYPICAL CHARACTERISTICS

**TLE2084**
**SUPPLY CURRENT**
**vs**
**DIFFERENTIAL INPUT VOLTAGE**

$V_{CC+} = 5$ V
$V_{CC-} = 0$
$V_{IC} = 4.5$ V
$T_A = 25°C$
Open Loop
No Load

**Figure 46**

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

$V_{CC\pm} = \pm15$ V
$V_{IC} = 0$
$T_A = 25°C$
Open Loop
No Load

**Figure 47**

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

$V_{CC\pm} = \pm15$ V
$V_{IC} = 0$
$T_A = 25°C$
Open Loop
No Load

**Figure 48**

**TLE2084**
**SUPPLY CURRENT**
**vs**
**DIFFERENTIAL INPUT VOLTAGE**

$V_{CC\pm} = \pm15$ V
$V_{IC} = 0$
$T_A = 25°C$
Open Loop
No Load

**Figure 49**

## TYPICAL CHARACTERISTICS†

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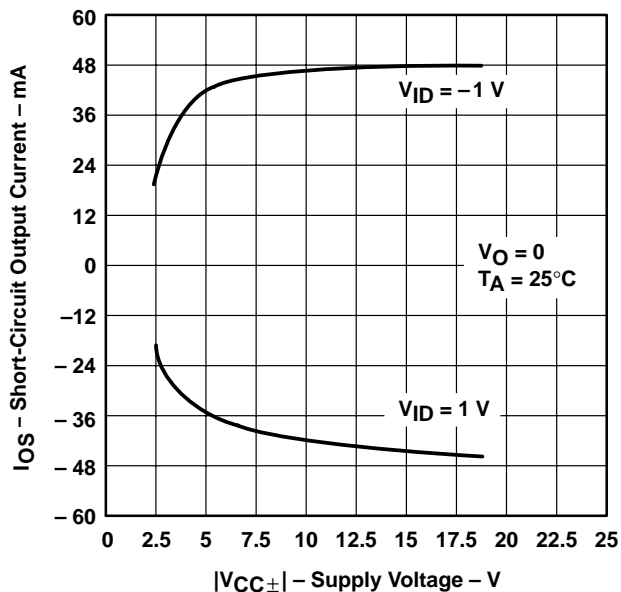vs
SUPPLY VOLTAGE**



**Figure 50**

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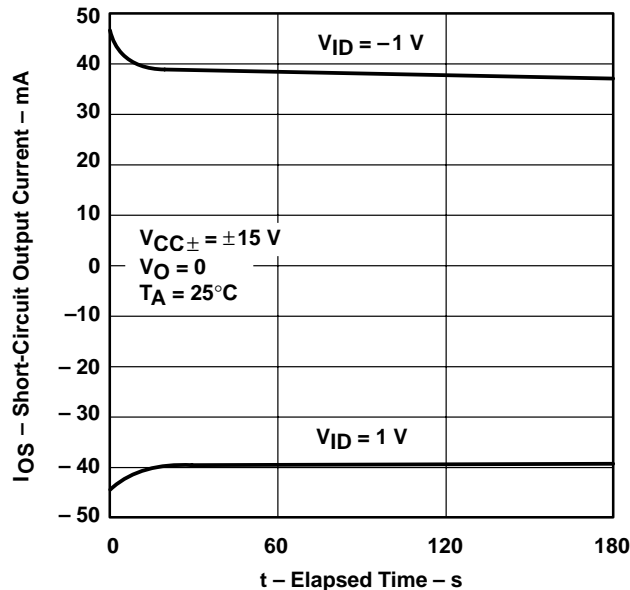


**Figure 51**

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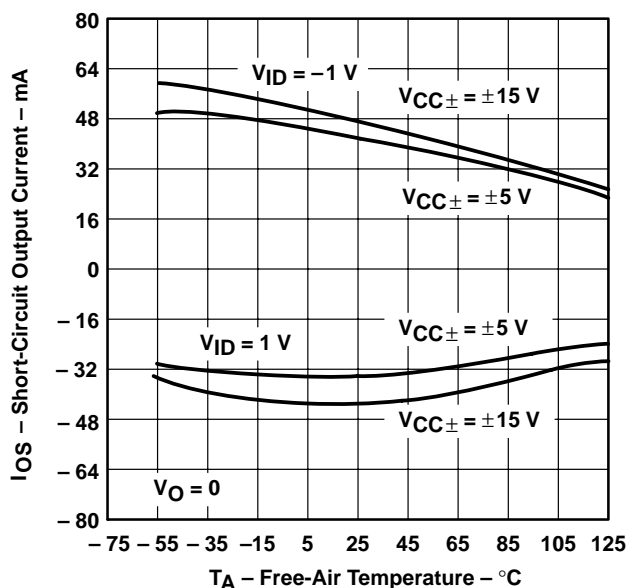vs
FREE-AIR TEMPERATURE**



**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.

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## TYPICAL CHARACTERISTICS†

### SLEW RATE vs FREE-AIR TEMPERATURE



$V_{CC\pm} = \pm15$ V
$R_L = 2$ k$\Omega$
$C_L = 100$ pF

SR−

SR+

**Figure 54**

### SLEW RATE vs LOAD RESISTANCE



Rising Edge

$V_{CC\pm} = \pm5$ V
$V_{O\pm} = \pm2.5$ V

$V_{CC\pm} = \pm15$ V
$V_{O\pm} = \pm10$ V

$A_V = -1$
$C_L = 100$ pF
$T_A = 25°C$

Falling Edge

**Figure 55**

### SLEW RATE vs DIFFERENTIAL INPUT VOLTAGE



$A_V = -1$

$A_V = 1$

Rising Edge

$V_{CC\pm} = \pm15$ V
$V_{O\pm} = \pm10$ V (10% − 90%)
$C_L = 100$ pF
$T_A = 25°C$

Falling Edge

$A_V = -1$

$A_V = 1$

**Figure 56**

### EQUIVALENT INPUT NOISE VOLTAGE vs FREQUENCY



$V_{CC\pm} = \pm15$ V
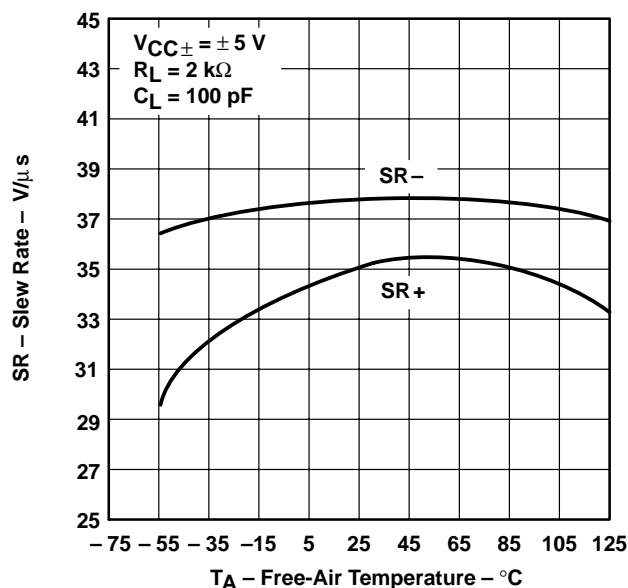$V_{IC} = 0$
$R_S = 20$ $\Omega$
$T_A = 25°C$

**Figure 57**

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.
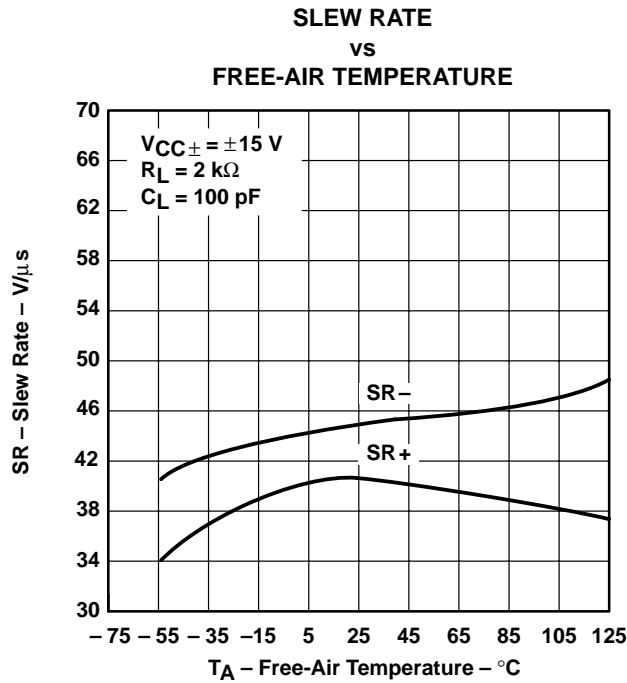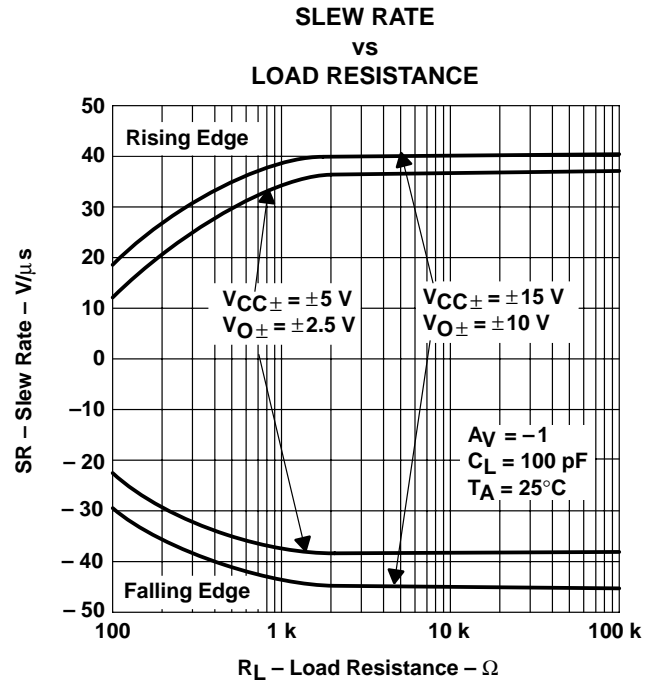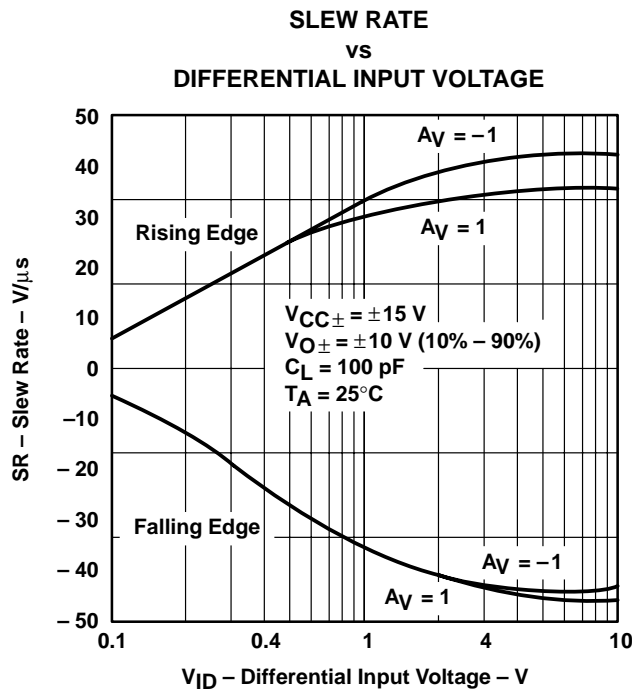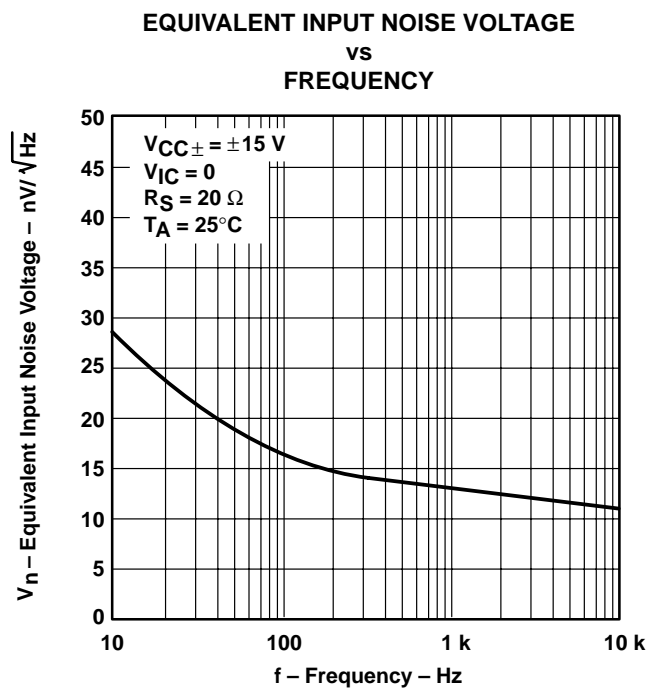
![Texas Instruments logo]
# TEXAS
# INSTRUMENTS

## TYPICAL CHARACTERISTICS

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

$V_{CC\pm} = \pm 15$ V
$V_{IC} = 0$
$R_S = 20$ $\Omega$
$T_A = 25°C$

Peak-to-Peak

RMS
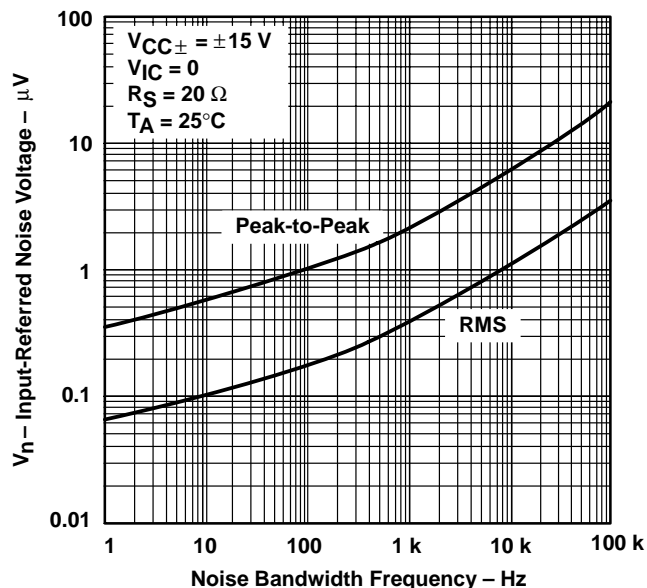
**Figure 58**

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

$V_{CC\pm} = \pm 15$ V
f = 0.1 to 10 Hz
$T_A = 25°C$

**Figure 59**

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

Start Frequency: 12.5 Hz
Stop Frequency: 20 kHz
$V_{CC\pm} = \pm 15$ V
$V_{IC} = 0$
$T_A = 25°C$

**Figure 60**

**TOTAL HARMONIC DISTORTION PLUS NOISE**
**vs**
**FREQUENCY**

$A_V = 100$, $R_L = 600$ $\Omega$
$A_V = 100$, $R_L = 2$ k$\Omega$
$A_V = 10$, $R_L = 600$ $\Omega$
$A_V = 10$, $R_L = 2$ k$\Omega$

$V_{CC\pm} = \pm 5$ V
$V_{O(PP)} = 5$ V
$T_A = 25°C$
Filter: 10-Hz to 500-kHz Band Pass

**Figure 61**

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# TYPICAL CHARACTERISTICS†

**TOTAL HARMONIC DISTORTION PLUS NOISE
vs
FREQUENCY**

Filter: 10-Hz to 500-kHz Band Pass
$V_{CC\pm} = \pm 15$ V
$V_{O(PP)} = 20$ V
$T_A = 25°C$

$A_V = 100$, $R_L = 600$ Ω

$A_V = 100$, $R_L = 2$ kΩ

$A_V = 10$, $R_L = 600$ Ω

$A_V = 10$, $R_L = 2$ kΩ

THD + N – Total Harmonic Distortion + Noise – %

f – Frequency – Hz

**Figure 62**

**UNITY-GAIN BANDWIDTH
vs
LOAD CAPACITANCE**

$V_{CC\pm} = \pm 15$ V
$V_{IC} = 0$
$V_O = 0$
$R_L = 2$ kΩ
$T_A = 25°C$

$B_1$ – Unity-Gain Bandwidth – MHz

$C_L$ – Load Capacitance – pF

**Figure 63**

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

f = 100 kHz
$V_{IC} = 0$
$V_O = 0$
$R_L = 2$ kΩ
$C_L = 100$ pF

$V_{CC\pm} = \pm 15$ V

$V_{CC\pm} = \pm 5$ V

Gain-Bandwidth Product – MHz

$T_A$ – Free-Air Temperature – °C

**Figure 64**

**GAIN-BANDWIDTH PRODUCT
vs
SUPPLY VOLTAGE**

f = 100 kHz
$V_{IC} = 0$
$V_O = 0$
$R_L = 2$ kΩ
$C_L = 100$ pF
$T_A = 25°C$

Gain-Bandwidth Product – MHz

$|V_{CC\pm}|$ – Supply Voltage – V
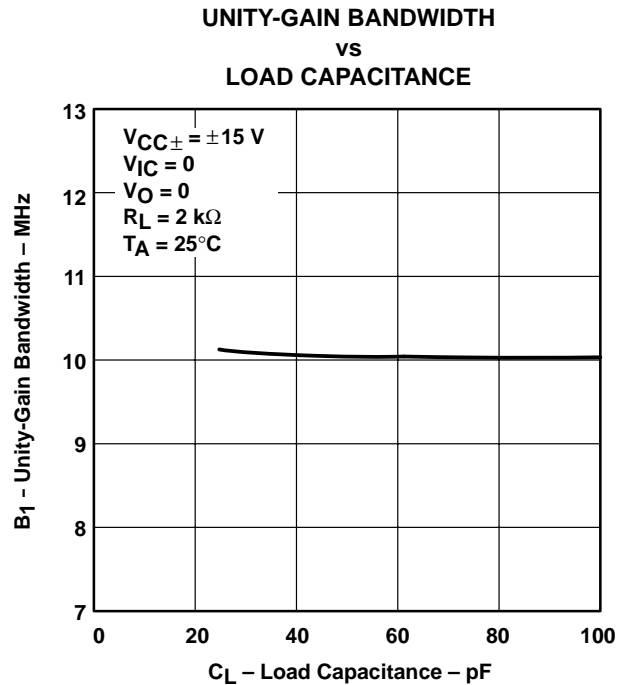
**Figure 65**

† 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**



$V_{CC\pm} = \pm 15$ V
$V_{IC} = 0$
$V_O = 0$
$R_L = 2$ kΩ
$T_A = 25°C$

**Figure 66**

**PHASE MARGIN**
**vs**
**FREE-AIR TEMPERATURE**



$V_{IC} = 0$
$V_O = 0$
$R_L = 2$ kΩ

$V_{CC\pm} = \pm 15$ V
$C_L = 25$ pF
$V_{CC\pm} = \pm 5$ V
$V_{CC\pm} = \pm 15$ V
$C_L = 100$ pF
$V_{CC\pm} = \pm 5$ V

**Figure 67**

**PHASE MARGIN**
**vs**
**SUPPLY VOLTAGE**



$C_L = 25$ pF
$C_L = 100$ pF

$V_{IC} = 0$
$V_O = 0$
$R_L = 2$ kΩ
$T_A = 25°C$

**Figure 68**

**PHASE MARGIN**
**vs**
**LOAD CAPACITANCE**



$V_{CC\pm} = \pm 15$ V
$V_{CC\pm} = \pm 5$ V

$V_{IC} = 0$
$V_O = 0$
$R_L = 2$ kΩ
$T_A = 25°C$

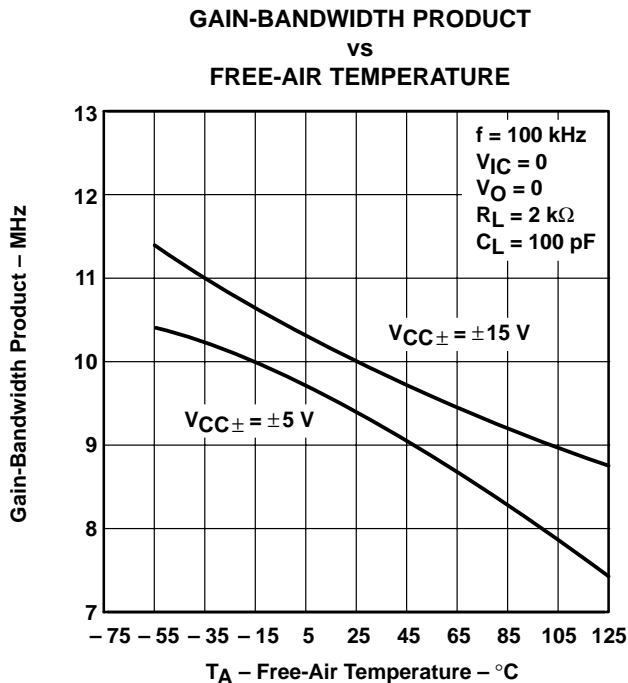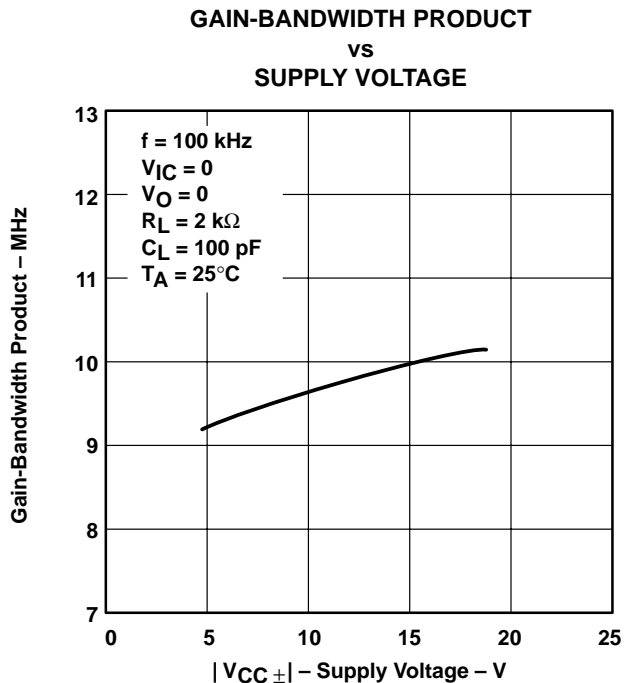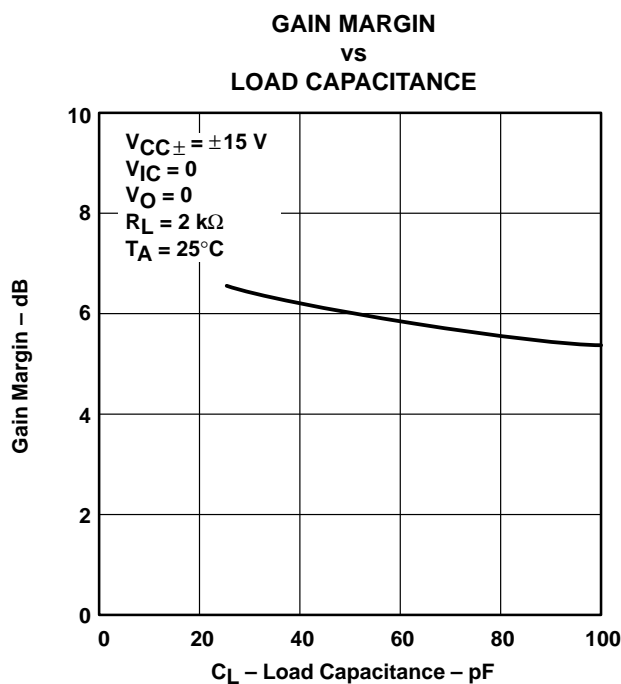**Figure 69**

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

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## 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**
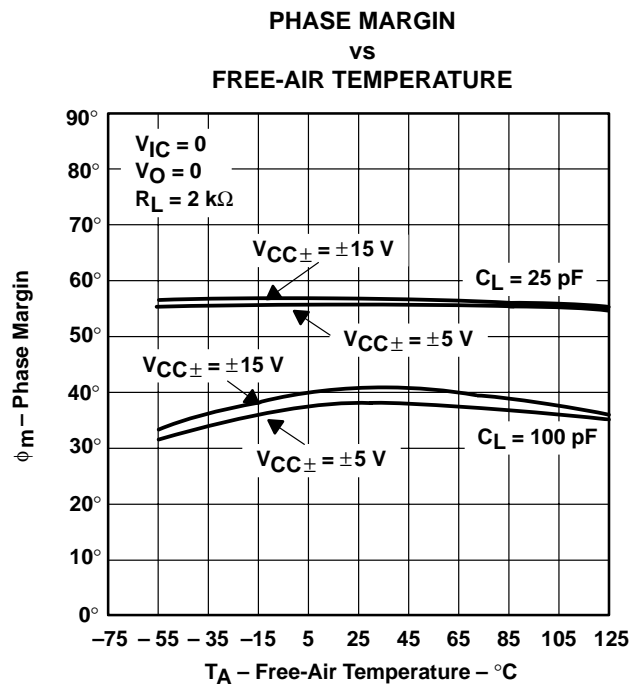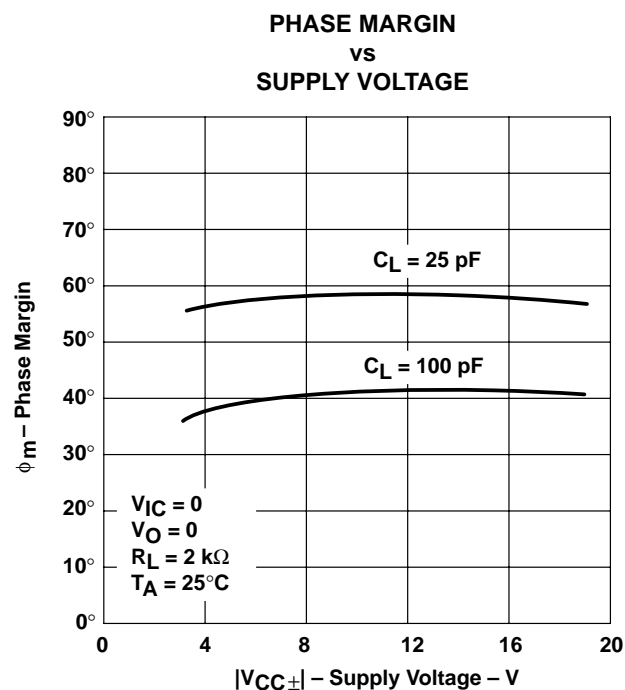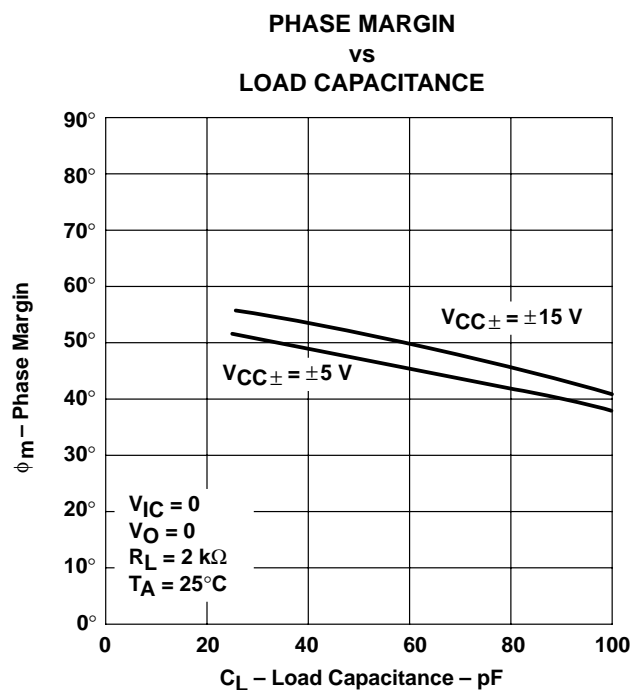


**Figure 73**

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

## APPLICATION INFORMATION
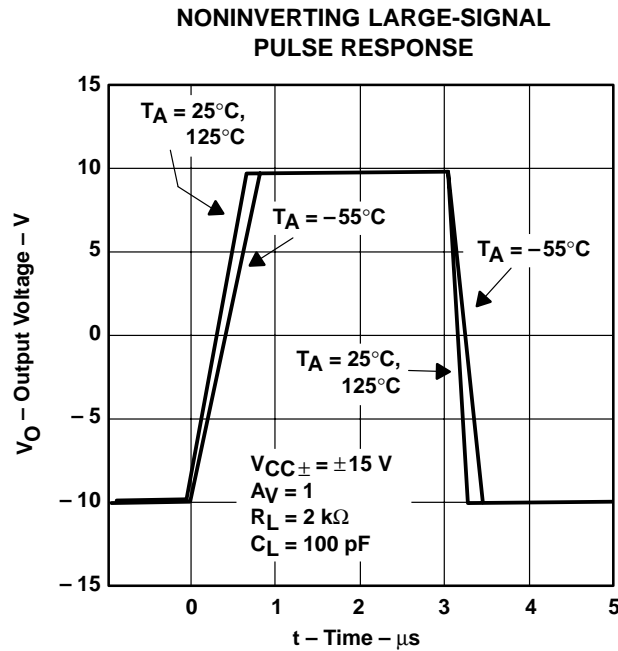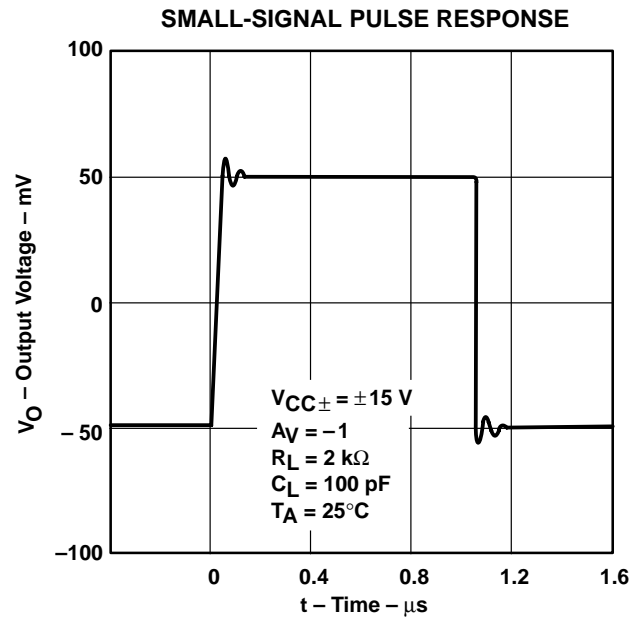
### input characteristics

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.
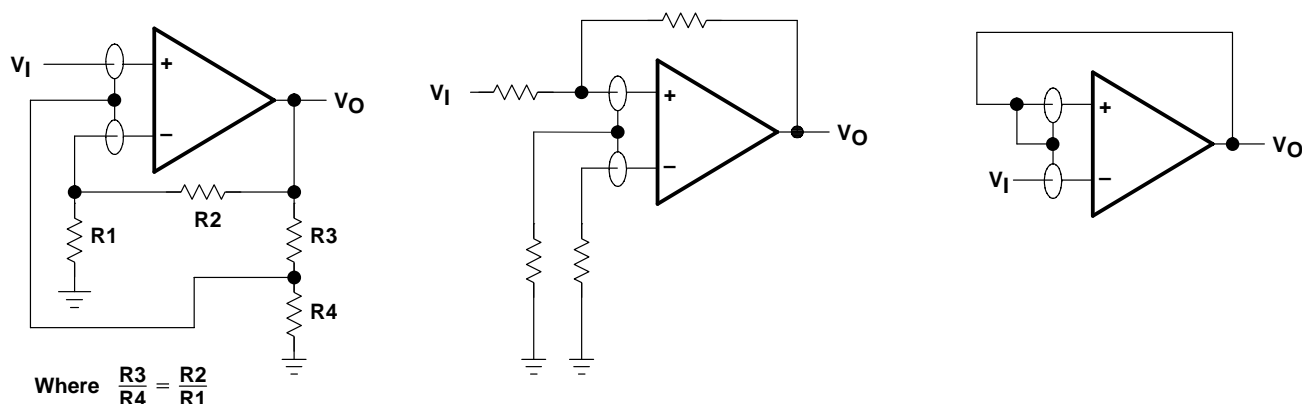
**Figure 74. Use of Guard Rings**

### 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.
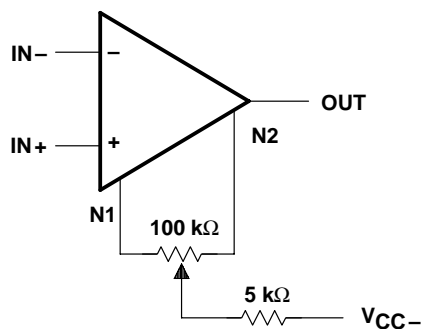
**Figure 75. Input Offset Voltage Nulling**

**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**

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## MECHANICAL INFORMATION

**D (R-PDSO-G\*\*)**                                   **PLASTIC SMALL-OUTLINE PACKAGE**

**14 PIN SHOWN**
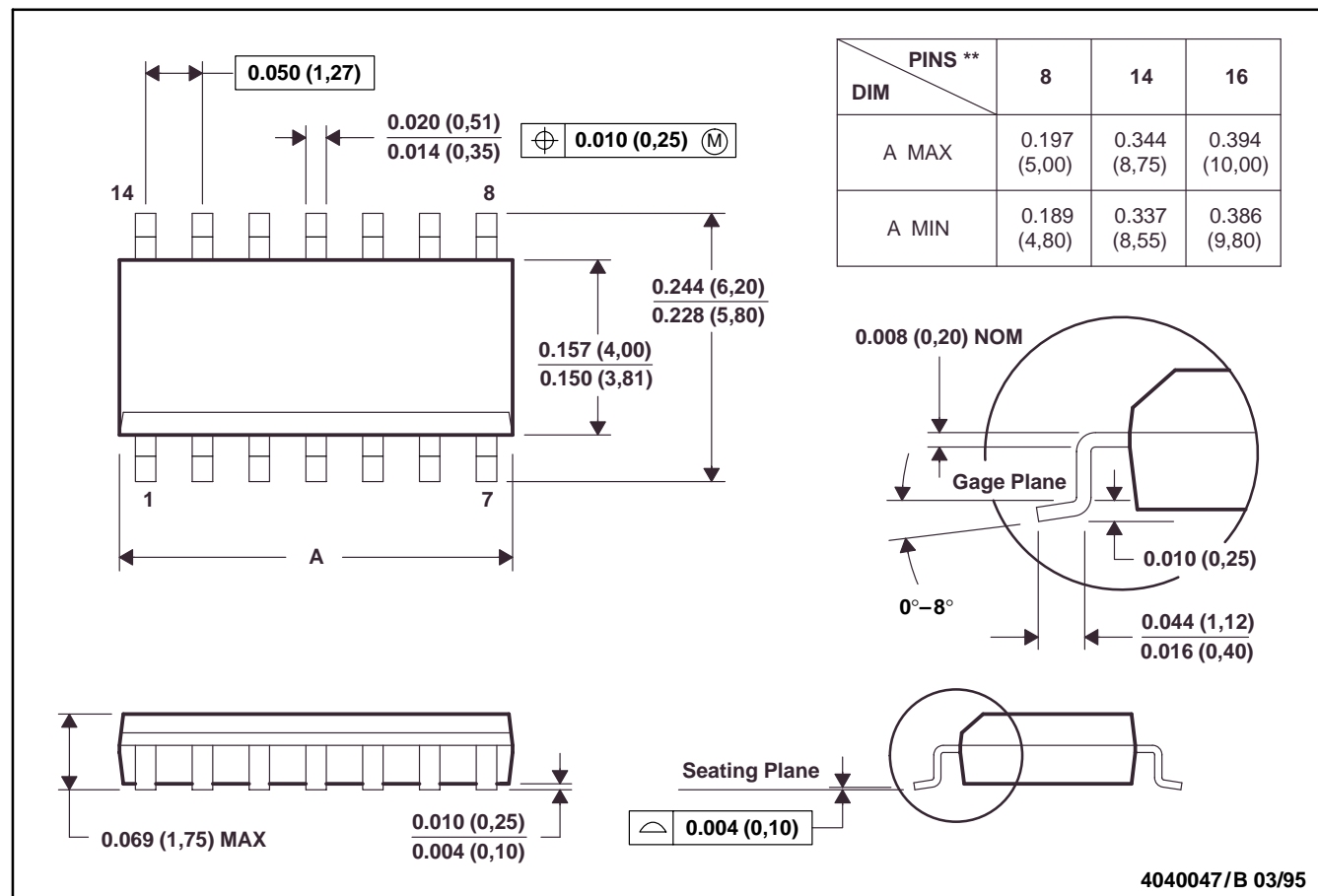


| PINS \*\* DIM | 8 | 14 | 16 |
|---|---|---|---|
| A MAX | 0.197 (5,00) | 0.344 (8,75) | 0.394 (10,00) |
| A MIN | 0.189 (4,80) | 0.337 (8,55) | 0.386 (9,80) |

4040047 / B 03/95

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

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## MECHANICAL INFORMATION

**DW (R-PDSO-G\*\*)**                                    **PLASTIC SMALL-OUTLINE PACKAGE**

**16 PIN SHOWN**
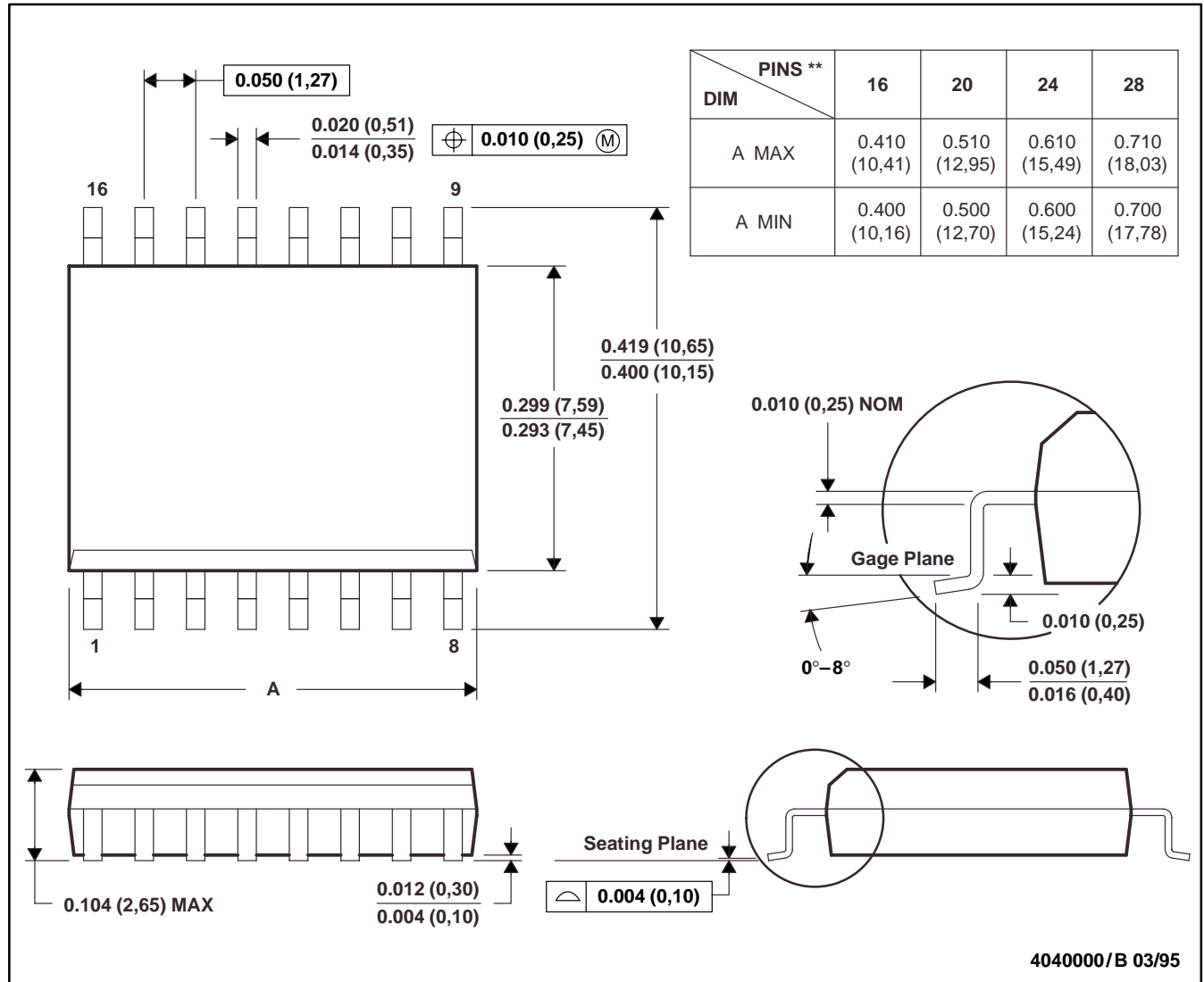
| PINS \*\* DIM | 16 | 20 | 24 | 28 |
|---|---|---|---|---|
| A MAX | 0.410 (10,41) | 0.510 (12,95) | 0.610 (15,49) | 0.710 (18,03) |
| A MIN | 0.400 (10,16) | 0.500 (12,70) | 0.600 (15,24) | 0.700 (17,78) |

0.050 (1,27)

$\dfrac{0.020\ (0,51)}{0.014\ (0,35)}$    ⊕ 0.010 (0,25) Ⓜ

16    9

$\dfrac{0.419\ (10,65)}{0.400\ (10,15)}$

$\dfrac{0.299\ (7,59)}{0.293\ (7,45)}$

0.010 (0,25) NOM

Gage Plane

0.010 (0,25)

0°–8°

$\dfrac{0.050\ (1,27)}{0.016\ (0,40)}$

1    8

A

0.104 (2,65) MAX

$\dfrac{0.012\ (0,30)}{0.004\ (0,10)}$

Seating Plane

△ 0.004 (0,10)

**4040000 / B 03/95**

NOTES: A. All linear dimensions are in inches (millimeters).
   B. This drawing is subject to change without notice.
   C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
   D. Falls within JEDEC MS-013

**TEXAS**
**INSTRUMENTS**

# TLE208x, TLE208xA, TLE208xY
# EXCALIBUR HIGH-SPEED JFET-INPUT
# OPERATIONAL AMPLIFIERS

SLOS182B – FEBRUARY 1997 – REVISED JUNE 2001

## MECHANICAL INFORMATION

**FK (S-CQCC-N**)**                                **LEADLESS CERAMIC CHIP CARRIER**

**28 TERMINAL SHOWN**
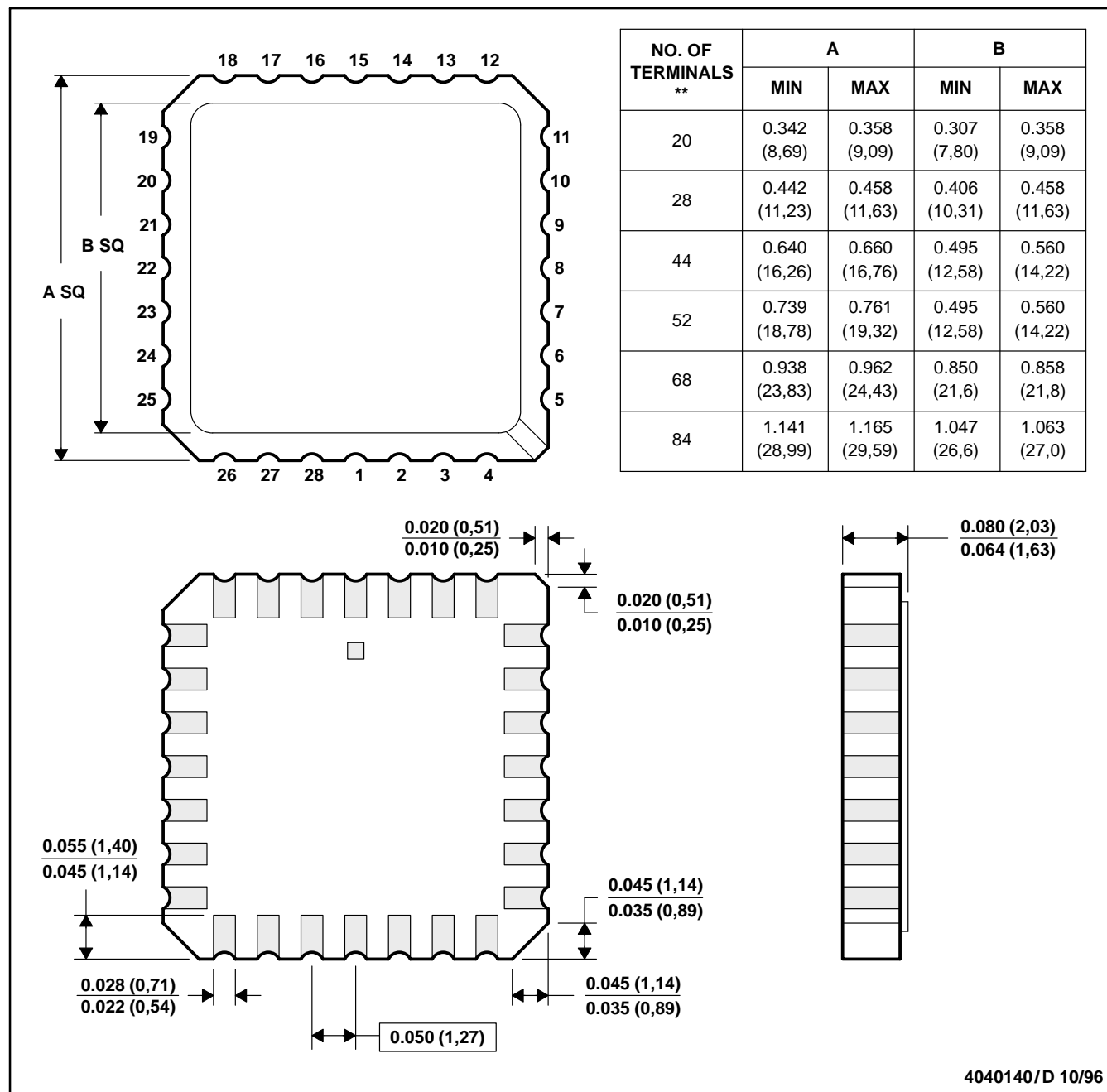
| NO. OF TERMINALS ** | A | | B | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| 20 | 0.342 (8,69) | 0.358 (9,09) | 0.307 (7,80) | 0.358 (9,09) |
| 28 | 0.442 (11,23) | 0.458 (11,63) | 0.406 (10,31) | 0.458 (11,63) |
| 44 | 0.640 (16,26) | 0.660 (16,76) | 0.495 (12,58) | 0.560 (14,22) |
| 52 | 0.739 (18,78) | 0.761 (19,32) | 0.495 (12,58) | 0.560 (14,22) |
| 68 | 0.938 (23,83) | 0.962 (24,43) | 0.850 (21,6) | 0.858 (21,8) |
| 84 | 1.141 (28,99) | 1.165 (29,59) | 1.047 (26,6) | 1.063 (27,0) |

0.020 (0,51) / 0.010 (0,25)

0.020 (0,51) / 0.010 (0,25)

0.080 (2,03) / 0.064 (1,63)

0.055 (1,40) / 0.045 (1,14)

0.045 (1,14) / 0.035 (0,89)

0.028 (0,71) / 0.022 (0,54)

0.045 (1,14) / 0.035 (0,89)

0.050 (1,27)

4040140 / D 10/96

NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package can be hermetically sealed with a metal lid.
D. The terminals are gold plated.
E. Falls within JEDEC MS-004

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## MECHANICAL INFORMATION

**J (R-GDIP-T\*\*)**                                              **CERAMIC DUAL-IN-LINE PACKAGE**

**14 PIN SHOWN**
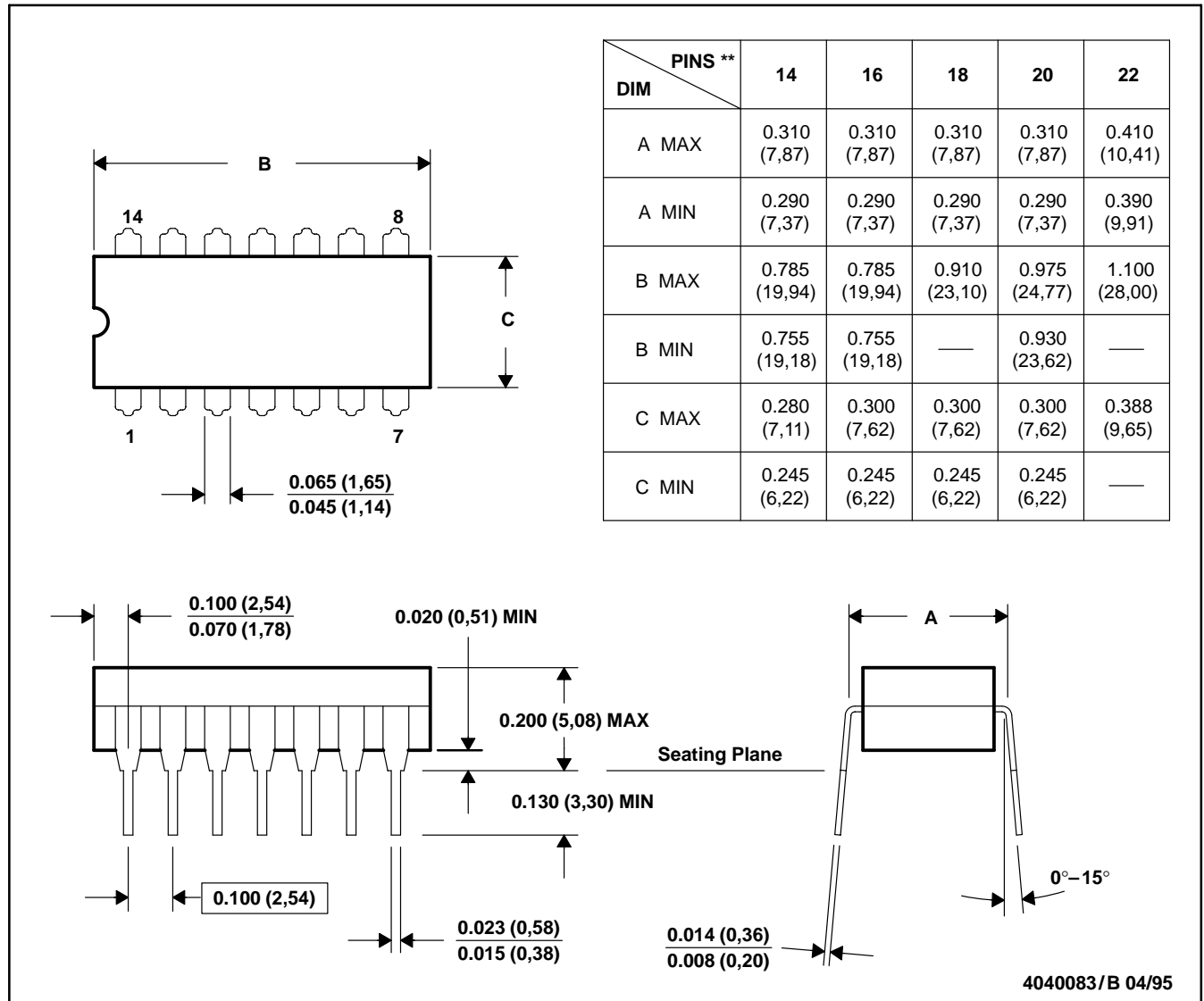
| DIM \ PINS ** | 14 | 16 | 18 | 20 | 22 |
|---|---|---|---|---|---|
| A  MAX | 0.310 (7,87) | 0.310 (7,87) | 0.310 (7,87) | 0.310 (7,87) | 0.410 (10,41) |
| A  MIN | 0.290 (7,37) | 0.290 (7,37) | 0.290 (7,37) | 0.290 (7,37) | 0.390 (9,91) |
| B  MAX | 0.785 (19,94) | 0.785 (19,94) | 0.910 (23,10) | 0.975 (24,77) | 1.100 (28,00) |
| B  MIN | 0.755 (19,18) | 0.755 (19,18) | ——— | 0.930 (23,62) | ——— |
| C  MAX | 0.280 (7,11) | 0.300 (7,62) | 0.300 (7,62) | 0.300 (7,62) | 0.388 (9,65) |
| C  MIN | 0.245 (6,22) | 0.245 (6,22) | 0.245 (6,22) | 0.245 (6,22) | ——— |

B

14          8

C

1          7

0.065 (1,65)
0.045 (1,14)

0.100 (2,54)
0.070 (1,78)

0.020 (0,51) MIN

0.200 (5,08) MAX

Seating Plane

0.130 (3,30) MIN

A

0.100 (2,54)

0.023 (0,58)
0.015 (0,38)

0.014 (0,36)
0.008 (0,20)

0°−15°

4040083 / B 04/95

NOTES:  A.  All linear dimensions are in inches (millimeters).
        B.  This drawing is subject to change without notice.
        C.  This package can be hermetically sealed with a ceramic lid using glass frit.
        D.  Index point is provided on cap for terminal identification only on press ceramic glass frit seal.
        E.  Falls within MIL-STD-1835 GDIP1-T14, GDIP1-T16, GDIP1-T18, GDIP1-T20, and GDIP1-T22

**TEXAS
INSTRUMENTS**

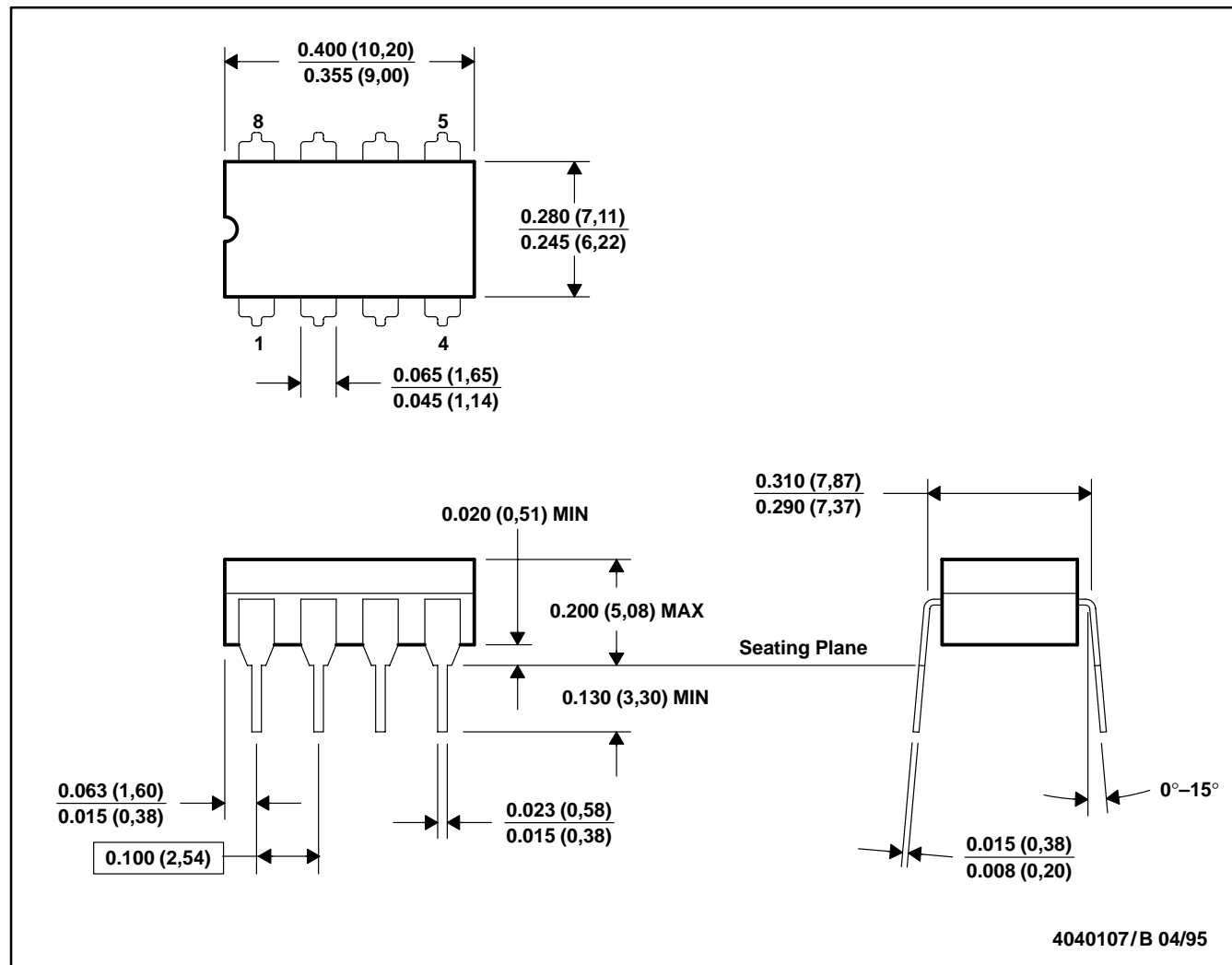POST OFFICE BOX 655303 ● DALLAS, TEXAS 75265

## MECHANICAL INFORMATION

**JG (R-GDIP-T8)**                                                **CERAMIC DUAL-IN-LINE PACKAGE**



4040107 / B 04/95

NOTES:  A.  All linear dimensions are in inches (millimeters).
   B.  This drawing is subject to change without notice.
   C.  This package can be hermetically sealed with a ceramic lid using glass frit.
   D.  Index point is provided on cap for terminal identification only on press ceramic glass frit seal.
   E.  Falls within MIL-STD-1835 GDIP1-T8

## TEXAS
## INSTRUMENTS

POST OFFICE BOX 655303 ● DALLAS, TEXAS 75265

# MECHANICAL INFORMATION

**N (R-PDIP-T\*\*)**                                                    **PLASTIC DUAL-IN-LINE PACKAGE**

**16 PIN SHOWN**
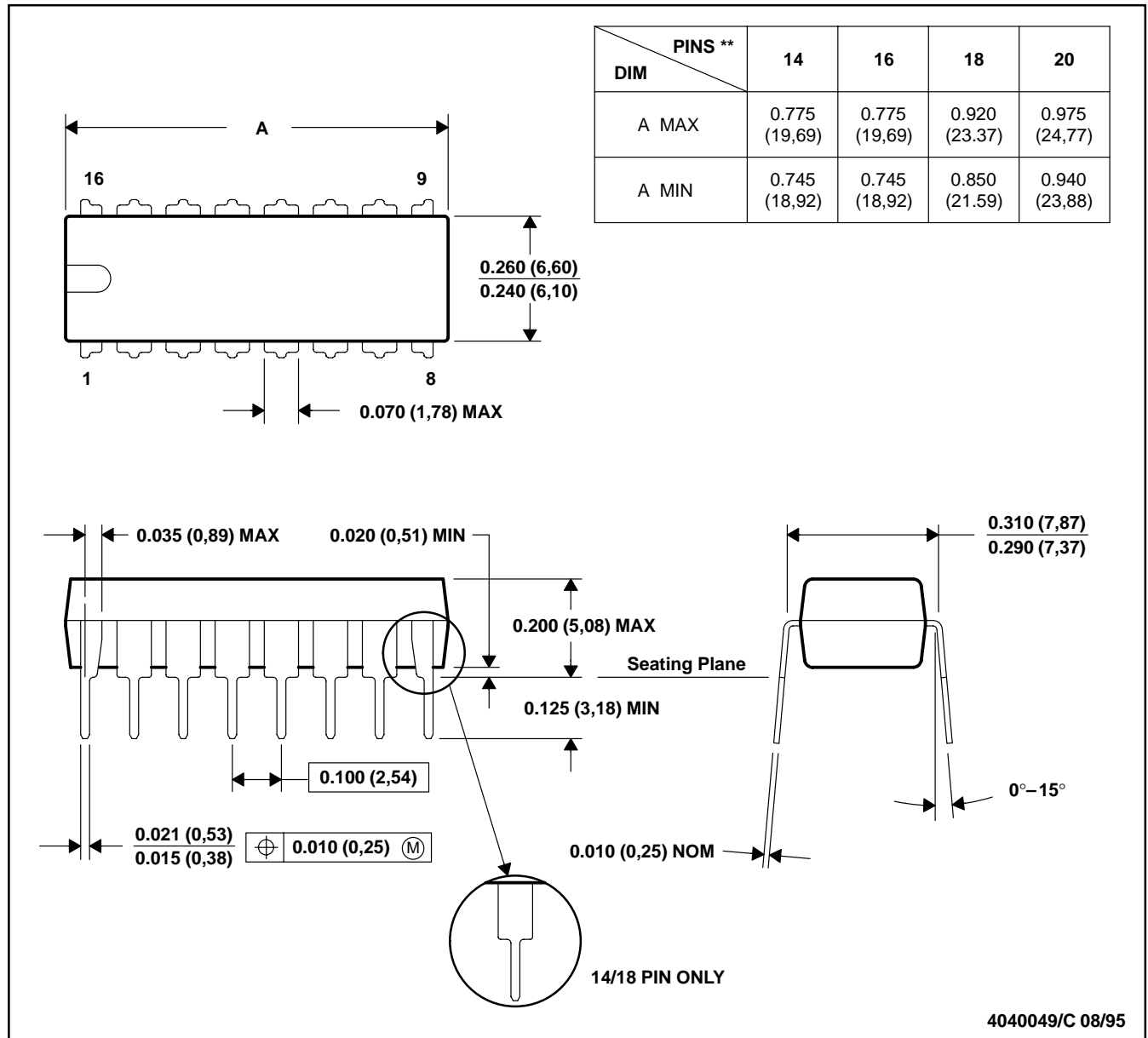


| PINS \*\* <br> DIM | 14 | 16 | 18 | 20 |
|---|---|---|---|---|
| A MAX | 0.775 (19,69) | 0.775 (19,69) | 0.920 (23.37) | 0.975 (24,77) |
| A MIN | 0.745 (18,92) | 0.745 (18,92) | 0.850 (21.59) | 0.940 (23,88) |

**A**

16                    9

0.260 (6,60)
0.240 (6,10)

1                     8

0.070 (1,78) MAX

0.035 (0,89) MAX        0.020 (0,51) MIN

0.310 (7,87)
0.290 (7,37)

0.200 (5,08) MAX

Seating Plane

0.125 (3,18) MIN

0.100 (2,54)

0°−15°

0.021 (0,53)
0.015 (0,38)    ⊕  0.010 (0,25)  Ⓜ

0.010 (0,25) NOM

14/18 PIN ONLY

**4040049/C 08/95**

NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Falls within JEDEC MS-001 (20 pin package is shorter then MS-001.)

**TEXAS
INSTRUMENTS**

**TLE208x, TLE208xA, TLE208xY**
**EXCALIBUR HIGH-SPEED JFET-INPUT**
**OPERATIONAL AMPLIFIERS**
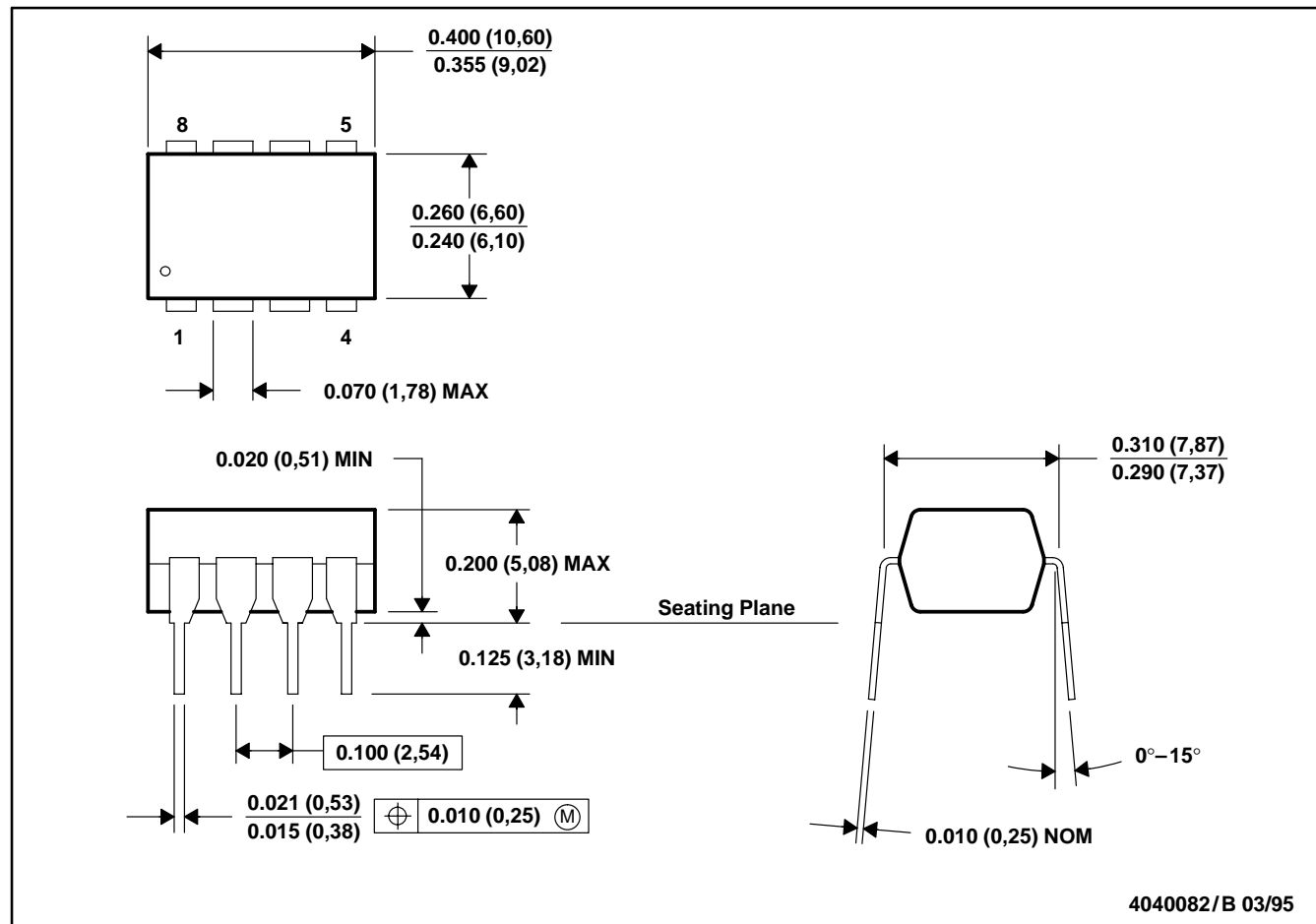SLOS182B – FEBRUARY 1997 – REVISED JUNE 2001

## MECHANICAL INFORMATION

**P (R-PDIP-T8)**                             **PLASTIC DUAL-IN-LINE PACKAGE**

0.400 (10,60) / 0.355 (9,02)
0.260 (6,60) / 0.240 (6,10)
0.070 (1,78) MAX
0.020 (0,51) MIN
0.200 (5,08) MAX
0.125 (3,18) MIN
Seating Plane
0.100 (2,54)
0.021 (0,53) / 0.015 (0,38)
0.010 (0,25) M
0.310 (7,87) / 0.290 (7,37)
0°–15°
0.010 (0,25) NOM

4040082 / B 03/95

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

TEXAS INSTRUMENTS

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## PACKAGING INFORMATION

| Orderable Device | Status [1] | Package Type | Package Drawing | Pins | Package Qty | Eco Plan [2] | Lead/Ball Finish | MSL Peak Temp [3] |
|---|---|---|---|---|---|---|---|---|
| TLE2081ACD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2081ACDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2081ACDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2081ACP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TLE2081ACPE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TLE2081AID | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2081AIP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TLE2081AIPE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TLE2081CD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2081CDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2081CDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2081CDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2081CP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TLE2081CPE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TLE2081ID | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2081IDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2081IP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TLE2081IPE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TLE2082ACD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2082ACDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2082ACDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2082ACDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2082ACP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TLE2082ACPE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TLE2082AID | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |

| Orderable Device | Status [1] | Package Type | Package Drawing | Pins | Package Qty | Eco Plan [2] | Lead/Ball Finish | MSL Peak Temp [3] |
|---|---|---|---|---|---|---|---|---|
| TLE2082AIDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2082AIDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2082AIDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2082AIP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TLE2082AIPE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TLE2082AMFKB | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | Level-NC-NC-NC |
| TLE2082AMJG | ACTIVE | CDIP | JG | 8 | 1 | TBD | A42 SNPB | Level-NC-NC-NC |
| TLE2082AMJGB | ACTIVE | CDIP | JG | 8 | 1 | TBD | A42 SNPB | Level-NC-NC-NC |
| TLE2082AMP | OBSOLETE | PDIP | P | 8 | | TBD | Call TI | Call TI |
| TLE2082CD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2082CDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2082CDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2082CDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2082CP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TLE2082CPE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TLE2082ID | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2082IDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2082IDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2082IDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2082IP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TLE2082IPE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TLE2082MFKB | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | Level-NC-NC-NC |
| TLE2082MJG | ACTIVE | CDIP | JG | 8 | 1 | TBD | A42 SNPB | Level-NC-NC-NC |
| TLE2082MJGB | OBSOLETE | CDIP | JG | 8 | | TBD | Call TI | Call TI |
| TLE2082MP | OBSOLETE | PDIP | P | 8 | | TBD | Call TI | Call TI |
| TLE2084ACDW | ACTIVE | SOIC | DW | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2084ACDWR | ACTIVE | SOIC | DW | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2084ACDWRG4 | ACTIVE | SOIC | DW | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2084ACN | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) |
|---|---|---|---|---|---|---|---|---|
| TLE2084ACNE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TLE2084AIDW | ACTIVE | SOIC | DW | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2084AIDWG4 | ACTIVE | SOIC | DW | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2084CDW | ACTIVE | SOIC | DW | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2084CDWG4 | ACTIVE | SOIC | DW | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2084CDWR | ACTIVE | SOIC | DW | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2084CDWRG4 | ACTIVE | SOIC | DW | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2084CN | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TLE2084CNE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| TLE2084IDW | ACTIVE | SOIC | DW | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2084IDWG4 | ACTIVE | SOIC | DW | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| TLE2084IDWR | OBSOLETE | SOIC | DW | 16 | | TBD | Call TI | Call TI |

**(1)** The marketing status values are defined as follows:
**ACTIVE:** Product device recommended for new designs.
**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.
**OBSOLETE:** TI has discontinued the production of the device.

**(2)** Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
**TBD:** The Pb-Free/Green conversion plan has not been defined.
**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

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