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- Direct Upgrades to TL05x, TL07x, and TL08x BiFET Operational Amplifiers
- Greater Than 2× Bandwidth (10 MHz) and 3× Slew Rate (45 V/µs) Than TL07x
- Ensured Maximum Noise Floor 17 nV/√Hz

- On-Chip Offset Voltage Trimming for Improved DC Performance
- Wider Supply Rails Increase Dynamic Signal Range to ±19 V

description

The TLE207x 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. Texas Instruments Excalibur process yields a typical noise floor of 11.6 nV/ $\sqrt{\text{Hz}}$, 17-nV/ $\sqrt{\text{Hz}}$ ensured maximum, offering immediate improvement in noise-sensitive circuits designed using the TL07x. The TLE207x also has 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 TLE207x 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 them 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.

The TLE207x family of BiFET amplifiers are Texas Instruments highest performance BiFETs, with tighter input offset voltage and ensured maximum noise specifications. Designers requiring less stringent specifications but seeking the improved ac characteristics of the TLE207x should consider the TLE208x operational amplifier family.

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 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 TLE207x 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.



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.



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TLE2071 AVAILABLE OPTIONS

| | | PACKAGED DEVICES | | | | | | | | | |
|----------------|--------------------------------|-------------------------|---------------------------|---------------------------|-------------------------|-----------------------------|--|--|--|--|--|
| T _A | V _{IO} max AT 25°C | SMALL OUTLINE† (FK) | | CERAMIC DIP (JG) | PLASTIC DIP (P) | CERAMIC FLAT PACK (U) | | | | | |
| 0°C to 70°C | 2 mV 4 mV | TLE2071ACD TLE2071CD | _ | _ | TLE2071ACP TLE2071CP | _ | | | | | |
| -40°C to 85°C | 2 mV 4 mV | TLE2071AID TLE2071ID | _ | _ | TLE2071AIP TLE2071IP | _ | | | | | |
| -55°C to 125°C | -55°C to 125°C 2 mV 4 mV | | TLE2071AMFK TLE2071MFK | TLE2071AMJG TLE2071MJG | | TLE2071AMU TLE2071MU | | | | | |

[†] The D packages are available taped and reeled. Add R suffix to device type (e.g., TLE2071ACDR).

TLE2072 AVAILABLE OPTIONS

| | | | PACKAGED DEVICES | | | | | | | | | |
|----------------|--------------------------------|--------------------------------------|---------------------------|---------------------------|-------------------------|-----------------------------|--|--|--|--|--|--|
| T _A | V _{IO} max AT 25°C | SMALL CHIP OUTLINE† CARRIER (D) (FK) | | CERAMIC DIP (JG) | PLASTIC DIP (P) | CERAMIC FLAT PACK (U) | | | | | | |
| 0°C to 70°C | 3.5 mV 6 mV | TLE2072ACD TLE2072CD | _ | _ | TLE2072ACP TLE2072CP | _ | | | | | | |
| -40°C to 85°C | 3.5 mV 6 mV | TLE2072AID TLE2072ID | _ | _ | TLE2072AIP TLE2072IP | _ | | | | | | |
| -55°C to 125°C | 3.5 mV 6 mV | _ | TLE2072AMFK TLE2072MFK | TLE2072AMJG TLE2072MJG | _ | TLE2072AMU TLE2072MU | | | | | | |

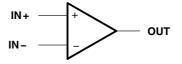
[†] The D packages are available taped and reeled. Add R suffix to device type (e.g., TLE2072ACDR).

TLE2074 AVAILABLE OPTIONS

| | | | P | ACKAGED DEVICE | s | | |
|----------------|--------------------------------|---------------------------------------|---------------------------|-------------------------|-------------------------|-----------------------------|--|
| T _A | V _{IO} max AT 25°C | SMALL CHIP OUTLINE† CARRIER (DW) (FK) | | CERAMIC DIP (J) | PLASTIC DIP (N) | CERAMIC FLAT PACK (W) | |
| 0°C to 70°C | 3 mV 5 mV | TLE2074ACDW TLE2074CDW | _ | _ | TLE2074ACN TLE2074CN | _ | |
| -40°C to 85°C | 3 mV 5 mV | TLE2074AIDW TLE2074IDW | _ | _ | TLE2074AIN TLE2074IN | _ | |
| -55°C to 125°C | 3 mV 5 mV | _ | TLE2074AMFK TLE2074MFK | TLE2074AMJ TLE2074MJ | _ | TLE2074AMW TLE2074MW | |

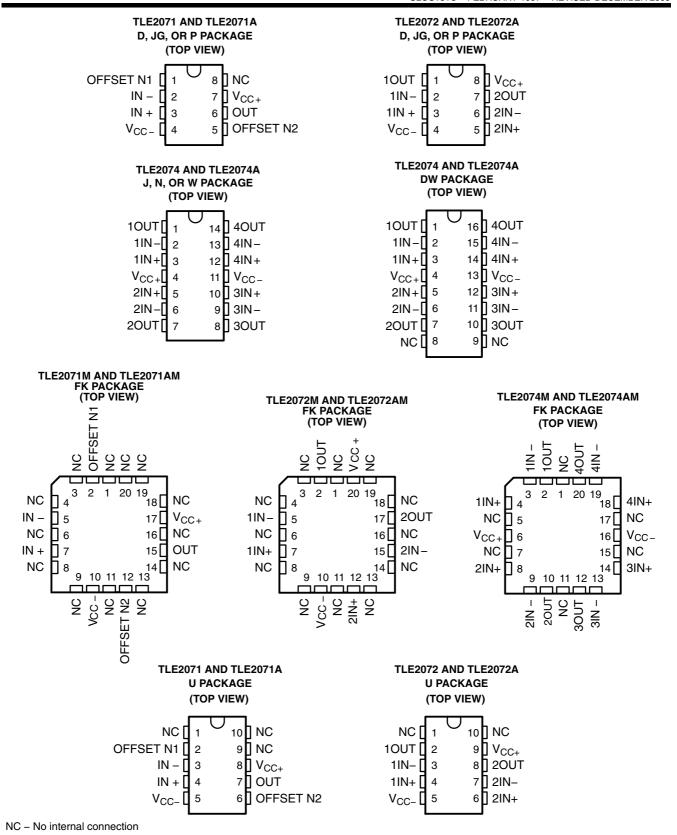
[†] The DW packages are available taped and reeled. Add R suffix to device type (e.g., TLE2074ACDWR).

symbol



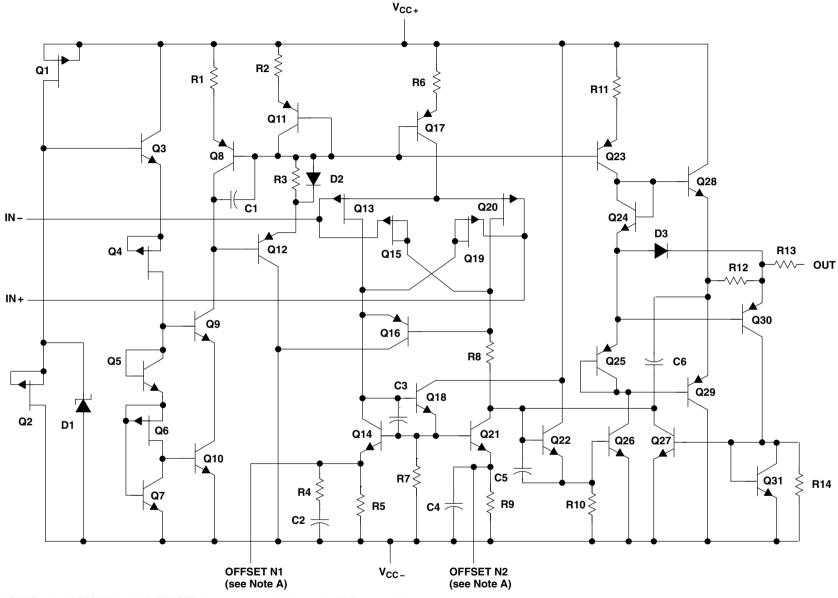


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TEXAS
INSTRUMENTS
POST OFFICE BOX 655300* DALLAS, TEXAS 75265



NOTES: A. OFFSET N1 AND OFFSET N2 are only available on the TLE2071x devices.

TEXAS INSTRUMENTS POST OFFICE BOX 655303 DALLAS, TEXAS 75265

equivalent schematic (continued)

| ACTUAL DEVICE COMPONENT COUNT | | | | | | | | | | |
|--|----|----|-----|--|--|--|--|--|--|--|
| COMPONENT TLE2071 TLE2072 TLE2074 | | | | | | | | | | |
| Transistors | 33 | 57 | 114 | | | | | | | |
| Resistors | 25 | 37 | 74 | | | | | | | |
| Diodes | 8 | 5 | 10 | | | | | | | |
| Capacitors 6 11 22 | | | | | | | | | | |

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

| Supply voltage, V _{CC+} (see Note 1) | | |
|--|---------------------------------|----------------|
| Differential input voltage range, V _{ID} (see Note 2) | | |
| Input voltage range, V _I (any input) | | |
| Input current, I _I (each input) | | |
| Output current, IO (each output) | | |
| Total current into V _{CC+} | | |
| Total current out of V _{CC} | | |
| Duration of short-circuit current at (or below) 25°C (see | e Note 3) | unlimited |
| Package thermal impedance, θ_{JA} (see Notes 4 and 5): | D package | 97.1°C/W |
| | DW package | 57.3°C/W |
| | N package | |
| | P package | |
| Package thermal impedance, θ_{JC} (see Notes 4 and 5): | | |
| | J package | |
| | JG package | |
| | U package | |
| | W package | |
| Operating free-air temperature range, T_A : C suffix | | |
| | | |
| | | |
| Storage temperature range | seconds: DW or N package | 260°C 260°C |
| Lead temperature 1,6 mm (1/16 inch) from case for 60 | seconds: J, JG, U, or w 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 the noninverting input with respect to the inverting input.
- 3. The output may be shorted to either supply. Temperatures and/or supply voltages must be limited to ensure that the maximum dissipation rate is not exceeded.
- 4. Maximum power dissipation is a function of $T_J(max)$, θ_{JA} , and T_A . The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(max) T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
- 5. The package thermal impedance is calculated in accordance with JESD 51-7 (plastic) or MIL-STD-883 Method 1012 (ceramic).

recommended operating conditions

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



TLE2071C electrical characteristics at specified free-air temperature, V_{CC^\pm} = ± 5 V (unless otherwise noted)

| | DADAMETED | TEST OO | NDITIONS | | Τι | _E20710 | | TLE2071AC | | | UNIT |
|-----------------------|---|---|----------------------------|------------------|-----------------|------------------|------|-----------------|------------------|-----|-------|
| | PARAMETER | TEST CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNII |
| v | logest offeet wells as | | | 25°C | | 0.34 | 4 | | 0.3 | 2 | |
| V_{IO} | Input offset voltage | | $V_{O} = 0$, | Full range | | | 6 | | | 4 | mV |
| α_{VIO} | Temperature coefficient of input offset voltage | $R_S = 50 \Omega$ | | Full range | | 3.2 | 29 | | 3.2 | 29 | μV/°C |
| | land the first account | | | 25°C | | 5 | 100 | | 5 | 100 | pА |
| I _{IO} | Input offset current | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 1.4 | | | 1.4 | nA |
| 1 | Input bias current | See Figure 4 | | 25°C | | 15 | 175 | | 15 | 175 | pА |
| I _{IB} | input bias current | | | Full range | | | 5 | | | 5 | nA |
| V_{ICR} | Common-mode input | R _S = 50 Ω | | 25°C | 5 to –1 | 5 to -1.9 | | 5 to –1 | 5 to -1.9 | | ٧ |
| VICH | voltage range | 115 - 30 32 | | Full range | 5 to -0.9 | | | 5 to -0.9 | | | • |
| | | $I_{O} = -200 \mu\text{A}$ | | 25°C | 3.8 | 4.1 | | 3.8 | 4.1 | | |
| | | 10 = -200 μΑ | | Full range | 3.7 | | | 3.7 | | | |
| V _{OM+} | Maximum positive peak | $I_{O} = -2 \text{ mA}$ | | 25°C | 3.5 | 3.9 | | 3.5 | 3.9 | | ٧ |
| V OM + | output voltage swing | 10 = -2 1114 | | Full range | 3.4 | | | 3.4 | | | V |
| | | $I_{O} = -20 \text{ mA}$ | | 25°C | 1.5 | 2.3 | | 1.5 | 2.3 | | |
| | | 10 = -20 1117 | | Full range | 1.5 | | | 1.5 | | | |
| | I _O = 200 μA | | 25°C | -3.5 | -4.2 | | -3.5 | -4.2 | | | |
| | | ιο = 200 με τ | 10 = 200 μΑ | | -3.4 | | | -3.4 | | | |
| V_{OM-} | Maximum negative peak | I _O = 2 mA | | 25°C | -3.7 | -4.1 | | -3.7 | -4.1 | | ٧ |
| - OIVI – | output voltage swing | -0 | | Full range | -3.6 | | | -3.6 | | | - |
| | | I _O = 20 mA | | 25°C | -1.5 | -2.4 | | -1.5 | -2.4 | | |
| | | 10 = 1 | I | Full range | -1.5 | | | -1.5 | | | |
| | | | $R_L = 600 \Omega$ | 25°C | 80 | 91 | | 80 | 91 | | |
| | | | _ | Full range | 79 | | | 79 | | | |
| A_{VD} | Large-signal differential | $V_{O} = \pm 2.3 \text{ V}$ | $R_L = 2 k\Omega$ | 25°C | 90 | 100 | | 90 | 100 | | dB |
| ,,, | voltage amplification | | | Full range | 89 | 100 | | 89 | 100 | | |
| | | | $R_L = 10 \text{ k}\Omega$ | 25°C | 95 | 106 | | 95 | 106 | | |
| | In and an eleterate | | | Full range | 94 | 4012 | | 94 | 4012 | | 0 |
| rį | Input resistance | V _{IC} = 0 | I a | 25°C | | 10 ¹² | | | 10 ¹² | | Ω |
| c _i | Input capacitance | V _{IC} = 0, See Figure 5 | Common mode | 25°C | | 11 | | | 11 | | рF |
| | | | Differential | 25°C | | 2.5 | | | 2.5 | | |
| Z _O | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMRR | Common-mode | V _{IC} = V _{ICR} min, | 25°C | 70 | 89 | | 70 | 89 | | dB | |
| OWINH | rejection ratio | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 68 | | | 68 | | | uБ |
| k _{SVR} | Supply-voltage rejection | $V_{CC\pm} = \pm 5 \text{ V t}$ | | 25°C | 82 | 99 | | 82 | 99 | | dB |
| SVN | ratio($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 80 | | | 80 | | | ~2 |

[†] Full range is 0°C to 70°C.



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TLE2071C electrical characteristics at specified free-air temperature, V_{CC^\pm} = ± 5 V (unless otherwise noted) (continued)

| | DADAMETED | TEST OF | TECT CONDITIONS | | TLE2071C | | | TL | UNIT | | |
|-----------|----------------------|-----------------|-----------------------|------------------|----------|-----|-----|------|------|-----|------|
| PARAMETER | | TEST CONDITIONS | | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | 0 | V 0 | Noteed | 25°C | 1.35 | 1.6 | 2.2 | 1.35 | 1.6 | 2.2 | |
| ICC | Supply current | $V_{O} = 0$, | No load | Full range | | | 2.2 | | | 2.2 | mA |
| | Short-circuit output | V 0 | V _{ID} = 1 V | 0500 | | -35 | | | -35 | | |
| los | current | $V_O = 0$ | $V_{ID} = -1 V$ | 25°C | | 45 | | | 45 | | mA |

[†] Full range is 0°C to 70°C.

TLE2071C operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 5~V$

| | | | | | Т | LE2071 | С | TL | E2071A | C | |
|--------------------|--------------------------------------|--|--|------------------|-----|--------|-----|-----|--------|-----|--------------------|
| | PARAMETER | TEST CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | | | | 25°C | | 35 | | | 35 | | |
| SR+ | Positive slew rate | $V_{O(PP)} = \pm 2.3 \text{ V},$ | | Full range | 23 | | | 23 | | | V/μs |
| | | $A_{VD} = -1,$ $C_{I} = 100 \text{ pF},$ | See Figure 1 | 25°C | | 38 | | | 38 | | |
| SR- | Negative slew rate | | Ç | Full range | 23 | | | 23 | | | V/μs |
| | Settling time | $A_{VD} = -1$, 2-V step, | To 10 mV | 25°C | | 0.25 | | | 0.25 | | |
| t _s | Settling time | $R_L = 1 \text{ k}\Omega,$ $C_L = 100 \text{ pF}$ | To 1 mV | 25 C | | 0.4 | | | 0.4 | | μs |
| ., | Equivalent input noise | | f = 10 Hz | 25°C | | 48 | 85 | | 48 | 85 | nV/√ Hz |
| V _n | voltage | | f = 10 kHz | 25°C | | 12 | 17 | | 12 | 17 | nv/√HZ |
| l v | Peak-to-peak equivalent | $R_S = 20 \Omega$, See Figure 3 | f = 10 Hz to 10 kHz | 25°C | | 6 | | | 6 | | |
| V _{N(PP)} | input noise voltage | | f = 0.1 Hz to 10 Hz | 25°C | | 0.6 | | | 0.6 | | μV |
| In | 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 | $V_{O(PP)} = 5 \text{ V},$ f = 1 kHz, $R_S = 25 \Omega$ | $A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$ | 25°C | Ó | 0.013% | | Ó | 0.013% | | |
| B ₁ | Unity-gain bandwidth | $V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | | 9.4 | | | 9.4 | | MHz |
| B _{OM} | Maximum output-swing bandwidth | $V_{O(PP)} = 4 \text{ V},$ $R_L = 2 \text{ k}\Omega$, | $A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$ | 25°C | | 2.8 | | | 2.8 | | MHz |
| φ _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.



TLE2071C electrical characteristics at specified free-air temperature, V_{CC^\pm} = ± 15 V (unless otherwise noted)

| | DADAMETED | TEST OO | NDITIONS | | Т | LE20710 | | TL | E2071A | С | UNIT |
|-----------------------|---|---|----------------------------|------------------|-------------------|-------------------|-----|-------------------|-------------------|-----|-------|
| | PARAMETER | IESI CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNII |
| v | Innut offeet voltage | | | 25°C | | 0.49 | 4 | | 0.47 | 2 | m\/ |
| V _{IO} | Input offset voltage | | $V_{O} = 0$, | Full range | | | 6 | | | 4 | mV |
| α_{VIO} | Temperature coefficient of input offset voltage | $R_S = 50 \Omega$ | | Full range | | 3.2 | 29 | | 3.2 | 29 | μV/°C |
| | land the standard | | | 25°C | | 6 | 100 | | 6 | 100 | pА |
| l _{IO} | Input offset current | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 1.4 | | | 1.4 | nA |
| | land this a summent | See Figure 4 | | 25°C | | 20 | 175 | | 20 | 175 | pА |
| I _{IB} | Input bias current | | | Full range | | | 5 | | | 5 | nA |
| V_{ICR} | Common-mode input | $R_S = 50 \Omega$ | | 25°C | 15 to –11 | 15 to –11.9 | | 15 to –11 | 15 to –11.9 | | ٧ |
| VICR | voltage range | ng = 30 sz | | Full range | 15 to -10.9 | | | 15 to -10.9 | | | V |
| | | $I_{O} = -200 \mu\text{A}$ | | 25°C | 13.8 | 14.1 | | 13.8 | 14.1 | | |
| | | 10 = -200 μΑ | | Full range | 13.7 | | | 13.7 | | | |
| V _{OM+} | Maximum positive peak | $I_{O} = -2 \text{ mA}$ | | 25°C | 13.5 | 13.9 | | 13.5 | 13.9 | | ٧ |
| V OM + | output voltage swing | 10 = -2 1114 | | Full range | 13.4 | | | 13.4 | | | v |
| | | $I_{O} = -20 \text{ mA}$ | | 25°C | 11.5 | 12.3 | | 11.5 | 12.3 | | |
| | | 10 = -20 IIIA | | Full range | 11.5 | | | 11.5 | | | |
| | | I _O = 200 μA | | 25°C | -13.8 | -14.2 | | -13.8 | -14.2 | | |
| | | 10 = 200 μ/ (| - 200 μπ | | -13.7 | | | -13.7 | | | |
| V_{OM-} | Maximum negative peak | I _O = 2 mA | | 25°C | -13.5 | -14 | | -13.5 | -14 | | ٧ |
| * OIVI – | output voltage swing | 10 = 2 11.7 | | Full range | -13.4 | | | -13.4 | | | • |
| | | I _O = 20 mA | | 25°C | -11.5 | -12.4 | | -11.5 | -12.4 | | |
| | | 10 20 1 | | Full range | -11.5 | | | -11.5 | | | |
| | | | $R_L = 600 \Omega$ | 25°C | 80 | 96 | | 80 | 96 | | |
| | | | | Full range | 79 | | | 79 | | | |
| A_{VD} | Large-signal differential | V _O = ±10 V | $R_L = 2 k\Omega$ | 25°C | 90 | 109 | | 90 | 109 | | dB |
| VD | voltage amplification | | | Full range | 89 | | | 89 | | | |
| | | | $R_L = 10 \text{ k}\Omega$ | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | | Full range | 94 | | | 94 | | | |
| rį | Input resistance | $V_{IC} = 0$ | | 25°C | | 10 ¹² | | | 10 ¹² | | Ω |
| c _i | Input capacitance | V _{IC} = 0, See Figure 5 | Common mode | 25°C | | 7.5 | | | 7.5 | | pF |
| | | 200 . Iguio 0 | Differential | 25°C | | 2.5 | | | 2.5 | | |
| z _o | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMRR | Common-mode | V _{IC} = V _{ICR} min, | 25°C | 80 | 98 | | 80 | 98 | | ٩D | |
| CIVIAN | rejection ratio | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 79 | | | 79 | - | | dB |
| kovo | Supply-voltage rejection | $V_{CC\pm} = \pm 5 \text{ V}$ | | 25°C | 82 | 99 | | 82 | 99 | | dB |
| k _{SVR} | ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{O} = 0$, | $R_S = 50 \Omega$ | Full range | 80 | | | 81 | | | uБ |

[†] Full range is 0°C to 70°C.



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TLE2071C electrical characteristics at specified free-air temperature, V_{CC^\pm} = ± 15 V (unless otherwise noted) (continued)

| | DADAMETED | TEST OO | TECT CONDITIONS | | TLE2071C | | | TL | UNIT | | |
|-----------|--------------------------------|-----------------|-----------------------|------------------|----------|-----|-----|------|------|-----|------|
| PARAMETER | | TEST CONDITIONS | | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | 0 | V 0 | NI- II | 25°C | 1.35 | 1.7 | 2.2 | 1.35 | 1.7 | 2.2 | |
| ICC | I _{CC} Supply current | $V_{O} = 0$, | No load | Full range | | | 2.2 | | | 2.2 | mA |
| | Short-circuit output | V 0 | V _{ID} = 1 V | 0500 | -30 | -45 | | -30 | -45 | | |
| IOS | los current | $V_O = 0$ | $V_{ID} = -1 V$ | 25°C | 30 | 48 | | 30 | 48 | | mA |

[†] Full range is 0°C to 70°C.

TLE2071C operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15~V$

| | DADAMETED | | UDITIONS | | Т | LE2071 | С | ΤL | E2071A | C | LINUT |
|--------------------|--------------------------------------|---|---|------------------|-----|--------|-----|-----|--------|-----|--------------------|
| | PARAMETER | TEST CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | | | | 25°C | 30 | 40 | | 30 | 40 | | |
| SR+ | Positive slew rate | $V_{O(PP)} = 10 \text{ V},$ | | Full range | 27 | | | 27 | | | V/μs |
| | | $R_L = 2 kΩ$, See Figure 1 | $C_L = 100 \text{ pF},$ | 25°C | 30 | 45 | | 30 | 45 | | |
| SR- | Negative slew rate | 3 | | Full range | 27 | | | 27 | | | V/μs |
| | Settling time | $A_{VD} = -1,$ 10-V step, | To 10 mV | 25°C | | 0.4 | | | 0.4 | | |
| t _s | Settling time | $R_L = 1 \text{ k}\Omega$, $C_L = 100 \text{ pF}$ | To 1 mV | 25 C | | 1.5 | | | 1.5 | | μs |
| · · | Equivalent input noise | | f = 10 Hz | 25°C | | 48 | 85 | | 48 | 85 | nV√ Hz |
| V _n | voltage | | f = 10 kHz | 25°C | | 12 | 17 | | 12 | 17 | IIV VIIZ |
| ., | Peak-to-peak equivalent | $R_S = 20 \Omega$, See Figure 3 | f = 10 Hz to 10 kHz | 0500 | | 6 | | | 6 | | ., |
| V _{N(PP)} | input noise voltage | | f = 0.1 Hz to 10 Hz | 25°C | | 0.6 | | | 0.6 | | μV |
| In | 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 | $V_{O(PP)} = 20 \text{ V},$ f = 1 kHz, $R_S = 25 \Omega$ | $A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$ | 25°C | (| 0.008% | | (| 0.008% | | |
| B ₁ | Unity-gain bandwidth | $V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | 8 | 10 | | 8 | 10 | | MHz |
| ВОМ | Maximum output-swing bandwidth | $V_{O(PP)} = 20 \text{ V},$ $R_L = 2 \text{ k}\Omega,$ | $A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$ | 25°C | 478 | 637 | _ | 478 | 637 | _ | kHz |
| φm | 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.



TLE2071I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted)

| | DADAMETED | TEST OF | NDITIONS | _ + | Т | LE2071 | l | TL | .E2071A | NI . | LINUT |
|-----------------------|---|--|----------------------------|------------------|-----------------|------------------|-----|-----------------|------------------|------|-------|
| | PARAMETER | TEST CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| v | Innut offeet veltere | | | 25°C | | 0.34 | 4 | | 0.3 | 2 | m\/ |
| V _{IO} | Input offset voltage | | $V_{O} = 0$, | Full range | | | 7.6 | | | 5.6 | mV |
| α_{VIO} | Temperature coefficient of input offset voltage | $R_S = 50 \Omega$, | | Full range | | 3.2 | 29 | | 3.2 | 29 | μV/°C |
| | l | | | 25°C | | 5 | 100 | | 5 | 100 | pА |
| l _{IO} | Input offset current | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 5 | | | 5 | nA |
| | land biogramment | See Figure 4 | | 25°C | | 15 | 175 | | 15 | 175 | pА |
| I _{IB} | Input bias current | | | Full range | | | 10 | | | 10 | nA |
| V_{ICR} | Common-mode input | $R_S = 50 \Omega$ | | 25°C | 5 to –1 | 5 to -1.9 | | 5 to –1 | 5 to -1.9 | | ٧ |
| VICH | voltage range | ng = 30 sz | | Full range | 5 to -0.8 | | | 5 to -0.8 | | | V |
| | | I _O = -200 μA | | 25°C | 3.8 | 4.1 | | 3.8 | 4.1 | | |
| | | 10 = -200 μΑ | | Full range | 3.7 | | | 3.7 | | | |
| V _{OM+} | Maximum positive peak | $I_{O} = -2 \text{ mA}$ | | 25°C | 3.5 | 3.9 | | 3.5 | 3.9 | | ٧ |
| V OM + | output voltage swing | 10 = -2 111A | | Full range | 3.4 | | | 3.4 | | | v |
| | | $I_{O} = -20 \text{ mA}$ | | 25°C | 1.5 | 2.3 | | 1.5 | 2.3 | | |
| | | 10 = -20 IIIA | | Full range | 1.5 | | | 1.5 | | | |
| | | I _O = 200 μA | | 25°C | -3.8 | -4.2 | | -3.8 | -4.2 | | |
| | | 10 = 200 μ/ τ | | Full range | -3.7 | | | -3.7 | | | |
| V_{OM-} | Maximum negative peak | I _O = 2 mA | | 25°C | -3.5 | -4.1 | | -3.5 | -4.1 | | ٧ |
| * OIVI – | output voltage swing | 10 = 2 1117 1 | | Full range | -3.4 | | | -3.4 | | | • |
| | | I _O = 20 mA | | 25°C | -1.5 | -2.4 | | -1.5 | -2.4 | | |
| | | 10 = 20 11171 | | Full range | -1.5 | | | -1.5 | | | |
| | | | $R_L = 600 \Omega$ | 25°C | 80 | 91 | | 80 | 91 | | |
| | | | 11[- 000 22 | Full range | 79 | | | 79 | | | |
| A_{VD} | Large-signal differential | $V_{O} = \pm 2.3 \text{ V}$ | $R_L = 2 k\Omega$ | 25°C | 90 | 100 | | 90 | 100 | | dB |
| · •VD | voltage amplification | | | Full range | 89 | | | 89 | | | ű.Z |
| | | | $R_L = 10 \text{ k}\Omega$ | 25°C | 95 | 106 | | 95 | 106 | | |
| | | | | Full range | 94 | | | 94 | | | |
| r _i | Input resistance | $V_{IC} = 0$ | | 25°C | | 10 ¹² | | | 10 ¹² | | Ω |
| Cį | Input capacitance | V _{IC} = 0, See Figure 5 | Common mode | 25°C | | 11 | | | 11 | | pF |
| | | Joo i igaio o | Differential | 25°C | | 2.5 | | | 2.5 | | |
| z _o | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMDD | Common-mode | V _{IC} = V _{ICR} mir | 1, | 25°C | 70 | 89 | | 70 | 89 | | 40 |
| CMRR | rejection ratio | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 68 | | | 68 | | | dB |
| | Supply-voltage rejection | $V_{CC\pm} = \pm 5 \text{ V}$ | | 25°C | 82 | 99 | | 82 | 99 | | 40 |
| k _{SVR} | ratio $(\Delta V_{CC\pm}/\Delta V_{IO})$ | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 80 | | | 80 | | | dB |

[†] Full range is –40°C to 85°C.



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TLE2071I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted) (continued)

| | DADAMETED | TEST CONDITIONS | | - + | TLE2071I | | | TL | .E2071A | l l | LINUT |
|-----|----------------------|-----------------|-----------------------|------------------|----------|-----|-----|------|---------|-----|-------|
| | PARAMETER | IESI CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | Complex accompany | V 0 | Nelsed | 25°C | 1.35 | 1.6 | 2.2 | 1.35 | 1.6 | 2.2 | 4 |
| ICC | Supply current | $V_{O} = 0$, | No load | Full range | | | 2.2 | | | 2.2 | mA |
| | Short-circuit output | V 0 | V _{ID} = 1 V | 0500 | | -35 | | | -35 | | A |
| los | current | $V_O = 0$ | $V_{ID} = -1 V$ | 25°C | | 45 | | | 45 | | mA |

[†] Full range is -40°C to 85°C.

TLE2071I operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 5~V$

| | | | | | T | LE2071 | | TL | .E2071A | .I | |
|--------------------|--------------------------------------|--|--|------------------|-----|--------|-----|-----|---------|-----|--------------------|
| | PARAMETER | TEST CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | | | | 25°C | | 35 | | | 35 | | |
| SR+ | Positive slew rate | $V_{O(PP)} = \pm 2.3$ | V, | Full range | 22 | | | 22 | | | V/μs |
| | | $A_{VD} = -1,$ $C_{I} = 100 \text{ pF},$ | See Figure 1 | 25°C | | 38 | | | 38 | | |
| SR- | Negative slew rate | | · · | Full range | 22 | | | 22 | | | V/μs |
| • | Settling time | $A_{VD} = -1,$ 2-V step, | To 10 mV | 25°C | | 0.25 | | | 0.25 | | |
| t _s | Settling time | $R_L = 1 \text{ k}\Omega,$ $C_L = 100 \text{ pF}$ | To 1 mV | 25 C | | 0.4 | | | 0.4 | | μS |
| V _n | Equivalent input noise | | f = 10 Hz | 25°C | | 48 | 85 | | 48 | 85 | nV/√ Hz |
| v _n | voltage | | f = 10 kHz | 25 C | | 12 | 17 | | 12 | 17 | IIV/ V⊓Z |
| ,, | Peak-to-peak equivalent | $R_S = 20 \Omega$, See Figure 3 | f = 10 Hz to 10 kHz | 0500 | | 6 | | | 6 | | ., |
| V _{N(PP)} | input noise voltage | | f = 0.1 Hz to 10 Hz | 25°C | | 0.6 | | | 0.6 | | μV |
| In | 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 | $V_{O(PP)} = 5 \text{ V},$ f = 1 kHz, $R_S = 25 \Omega$ | $A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$ | 25°C | 0 | .013% | | 0 | .013% | | |
| B ₁ | Unity-gain bandwidth | $V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | | 9.4 | | | 9.4 | | MHz |
| B _{OM} | Maximum output-swing bandwidth | $V_{O(PP)} = 4 V$, $R_L = 2 k\Omega$, | $A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$ | 25°C | | 2.8 | | | 2.8 | | MHz |
| φ _m | Phase margin at unity gain | $V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | | 56° | | | 56° | | |

[†] Full range is -40°C to 85°C.



TLE2071I electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = ± 15 V (unless otherwise noted)

| | DADAMETED | TEST OO | NDITIONS | - + | Т | LE2071 | | TL | _E2071A | N | UNIT |
|------------------|---|---|----------------------------|------------------|-------------------|-------------------|-----|-------------------|-------------------|-----|----------|
| | PARAMETER | TEST CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| V | Innut offeet veltage | | | 25°C | | 0.49 | 4 | | 0.47 | 2 | m\/ |
| V _{IO} | Input offset voltage | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 7.6 | | | 5.6 | mV |
| α_{VIO} | Temperature coefficient of input offset voltage | $R_S = 50 \Omega$, | | Full range | | 3.2 | 29 | | 3.2 | 29 | μV/°C |
| | land the state of | | | 25°C | | 6 | 100 | | 6 | 100 | pА |
| l _{IO} | Input offset current | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 5 | | | 5 | nA |
| | logest biog assument | See Figure 4 | | 25°C | | 20 | 175 | | 20 | 175 | pА |
| I _{IB} | Input bias current | | | Full range | | | 10 | | | 10 | nA |
| V | Common-mode input | R _S = 50 Ω | | 25°C | 15 to –11 | 15 to –11.9 | | 15 to –11 | 15 to –11.9 | | ٧ |
| V _{ICR} | voltage range | ng = 30 sz | | Full range | 15 to –10.8 | | | 15 to -10.8 | | | V |
| | | $I_{O} = -200 \mu A$ | | 25°C | 13.8 | 14.1 | | 13.8 | 14.1 | | |
| | | 10 = -200 μΑ | | Full range | 13.7 | | | 13.7 | | | |
| V _{OM+} | Maximum positive peak | $I_O = -2 \text{ mA}$ | | 25°C | 13.5 | 13.9 | | 13.5 | 13.9 | | V |
| VOM+ | output voltage swing | 10 = -2 IIIA | | Full range | 13.4 | | | 13.4 | | | v |
| | | $I_{O} = -20 \text{ mA}$ | | 25°C | 11.5 | 12.3 | | 11.5 | 12.3 | | |
| | | 10 = -20 IIIA | | Full range | 11.5 | | | 11.5 | | | |
| | | I _O = 200 μA | | 25°C | -13.8 | -14.2 | | -13.8 | -14.2 | | |
| | | 10 = 200 μΑ | | Full range | -13.7 | | | -13.7 | | | |
| V | Maximum negative peak | I _O = 2 mA | | 25°C | -13.5 | -14 | | -13.5 | -14 | | V |
| V_{OM-} | output voltage swing | 10 - 2 1117 | | Full range | -13.4 | | | -13.4 | | | |
| | | I _O = 20 mA | | 25°C | -11.5 | -12.4 | | -11.5 | -12.4 | | |
| | | 10 = 20 IIIA | _ | Full range | -11.5 | | | -11.5 | | | |
| | | | $R_L = 600 \Omega$ | 25°C | 80 | 96 | | 80 | 96 | | |
| | | | 11[= 000 32 | Full range | 79 | | | 79 | | | |
| A _{VD} | Large-signal differential | V _O = ± 10 V | $R_L = 2 k\Omega$ | 25°C | 90 | 109 | | 90 | 109 | | dB |
| , ,vD | voltage amplification | 100-100 | 11[- 2 1(22 | Full range | 89 | | | 89 | | | l GD |
| | | | $R_L = 10 \text{ k}\Omega$ | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | 11[- 10 1(22 | Full range | 94 | | | 94 | | | |
| r _i | Input resistance | V _{IC} = 0 | _ | 25°C | | 10 ¹² | | | 10 ¹² | | Ω |
| c _i | Input capacitance | V _{IC} = 0, See Figure 5 | Common mode | 25°C | | 7.5 | | | 7.5 | | pF |
| | | oce i igule 5 | Differential | 25°C | | 2.5 | | | 2.5 | | |
| z _o | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| | Common-mode | V _{IC} = V _{ICR} min, | ١, | 25°C | 80 | 98 | | 80 | 98 | | _ |
| CMRR | rejection ratio | $V_O = 0$, $R_S = 50 \Omega$ | | Full range | 79 | | | 79 | | | dB |
| | Supply-voltage rejection | $V_{CC\pm} = \pm 5 \text{ V}$ | | 25°C | 82 | 99 | | 82 | 99 | | 4D |
| k _{SVR} | ratio $(\Delta V_{CC\pm}/\Delta V_{IO})$ | $V_{O} = 0$, | $R_S = 50 \Omega$ | Full range | 80 | | | 80 | | | dB |

[†] Full range is -40°C to 85°C.



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TLE2071I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 15 V (unless otherwise noted) (continued)

| | DADAMETED | TEST CONDITIONS | | _ + | TLE2071I | | | TL | .E2071A | d . | UNIT |
|-----|----------------------|------------------|------------------------|------------------|----------|-----|-----|------|---------|-----|------|
| | PARAMETER | | | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | Owner to the company | .v. o | Noteed | 25°C | 1.35 | 1.7 | 2.2 | 1.35 | 1.7 | 2.2 | |
| ICC | Supply current | $V_{O} = 0$, | No load | Full range | | | 2.2 | | | 2.2 | mA |
| | Short-circuit output | .v. o | V _{ID} = 1 V | 0500 | -30 | -45 | | -30 | -45 | | |
| los | los current | $IV_{\circ} = 0$ | V _{ID} = -1 V | 25°C | 30 | 48 | | 30 | 48 | | mA |

[†] Full range is -40°C to 85°C.

TLE2071I operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15~V$

| | DADAMETED | TEOT 001 | IDITIONS | | T | LE2071 | | TL | .E2071A | I | |
|--------------------|--------------------------------------|---|---|------------------|-----|--------|-----|-----|---------|-----|--------------------|
| | PARAMETER | TEST CON | IDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | | | | 25°C | 30 | 40 | | 30 | 40 | | |
| SR+ | Positive slew rate | $V_{O(PP)} = \pm 10 \text{ V},$ | | Full range | 24 | | | 24 | | | V/μs |
| | | $A_{VD} = -1,$ $C_{L} = 100 \text{ pF},$ | See Figure 1 | 25°C | 30 | 45 | | 30 | 45 | | |
| SR- | Negative slew rate | 0 <u>L</u> = 100 pr, | Coo i iguro i | Full range | 24 | | | 24 | | | V/μs |
| t _s | Settling time | $A_{VD} = -1,$ 10-V step, | To 10 mV | 25°C | | 0.4 | | | 0.4 | | μs |
| 'S | Setting time | $R_L = 1 \text{ k}\Omega$, $C_L = 100 \text{ pF}$ | To 1 mV | 20 0 | | 1.5 | | | 1.5 | | μο |
| V_n | Equivalent input noise | | f = 10 Hz | 25°C | | 48 | 85 | | 48 | 85 | nV/√ Hz |
| v _n | voltage | | f = 10 kHz | 25 C | | 12 | 17 | | 12 | 17 | IIV/√⊓Z |
| V | Peak-to-peak equivalent | $R_S = 20 \Omega$, See Figure 3 | f = 10 Hz to 10 kHz | 25°C | | 6 | | | 6 | | |
| V _{N(PP)} | input noise voltage | | f = 0.1 Hz to 10 Hz | 25 0 | | 0.6 | | | 0.6 | | μV |
| In | 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 | $A_{VD} = 10,$ $R_L = 2 k\Omega,$ | 25°C | 0 | .008% | | 0 | .008% | | |
| B ₁ | Unity-gain bandwidth | $V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | 8 | 10 | | 8 | 10 | | MHz |
| B _{OM} | Maximum output-swing bandwidth | $V_{O(PP)} = 20 \text{ V},$ $R_L = 2 \text{ k}\Omega,$ | $A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$ | 25°C | 478 | 637 | | 478 | 637 | | kHz |
| φ _m | Phase margin at unity gain | $V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | | 57° | • | • | 57° | _ | |

[†] Full range is –40°C to 85°C.



TLE2071M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted)

| | DADAMETED | TEST 00 | NDITIONO | _ + | TL | E2071N | И | TL | E2071A | M | |
|-----------------------|---|--|----------------------------|------------------|-----------------|------------------|-----------------|-----------------|------------------|-----------------|-------|
| | PARAMETER | TEST CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| V | Innut offeet veltege | | | 25°C | | 0.34 | 4 | | 0.3 | 2 | m)/ |
| V_{IO} | Input offset voltage | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 9.2 | | | 7.2 | mV |
| α_{VIO} | Temperature coefficient of input offset voltage | $R_S = 50 \Omega$, | | Full range | | 3.2 | 29 [‡] | | 3.2 | 29 [‡] | μV/°C |
| | law it offers a commant | | | 25°C | | 5 | 100 | | 5 | 100 | pА |
| I _{IO} | Input offset current | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 20 | | | 20 | nA |
| | land black summer | See Figure 4 | | 25°C | | 15 | 175 | | 15 | 175 | pА |
| I _{IB} | Input bias current | | | Full range | | | 60 | | | 60 | nA |
| V _{ICR} | Common-mode input | R _S = 50 Ω | | 25°C | 5 to -1 | 5 to -1.9 | | 5 to -1 | 5 to -1.9 | | ٧ |
| VICK | voltage range | 115 - 00 32 | | Full range | 5 to -0.8 | | | 5 to -0.8 | | | • |
| | | $I_{O} = -200 \mu\text{A}$ | | 25°C | 3.8 | 4.1 | | 3.8 | 4.1 | | |
| | | 10 = -200 μΑ | | Full range | 3.6 | | | 3.6 | | | |
| V _{OM+} | Maximum positive peak | $I_{O} = -2 \text{ mA}$ | | 25°C | 3.5 | 3.9 | | 3.5 | 3.9 | | ٧ |
| VOM+ | output voltage swing | 10 = -2 IIIA | | Full range | 3.3 | | | 3.3 | | | V |
| | | la = 20 mA | | 25°C | 1.5 | 2.3 | | 1.5 | 2.3 | | |
| | | $I_0 = -20 \text{ mA}$ | | Full range | 1.4 | | | 1.4 | | | |
| | | | | 25°C | -3.8 | -4.2 | | -3.8 | -4.2 | | |
| | | $I_{O} = 200 \mu A$ | | Full range | -3.6 | | | -3.6 | | | |
| ., | Maximum negative peak | | | 25°C | -3.5 | -4.1 | | -3.5 | -4.1 | | V |
| V_{OM-} | output voltage swing | $I_O = 2 \text{ mA}$ | | Full range | -3.3 | | | -3.3 | | | V |
| | | | | 25°C | -1.5 | -2.4 | | -1.5 | -2.4 | | |
| | | $I_O = 20 \text{ mA}$ | | Full range | -1.4 | | | -1.4 | | | |
| | | | 5 222 0 | 25°C | 80 | 91 | | 80 | 91 | | |
| | | | $R_L = 600 \Omega$ | Full range | 78 | | | 78 | | | |
| _ | Large-signal differential | | | 25°C | 90 | 100 | | 90 | 100 | | |
| A_{VD} | voltage amplification | $V_0 = \pm 2.3 \text{ V}$ | $R_L = 2 k\Omega$ | Full range | 88 | | | 88 | | | dB |
| | | | | 25°C | 95 | 106 | | 95 | 106 | | |
| | | | $R_L = 10 \text{ k}\Omega$ | Full range | 93 | | | 93 | | | |
| rį | Input resistance | V _{IC} = 0 | • | 25°C | | 10 ¹² | | | 10 ¹² | | Ω |
| C _i | Input capacitance | V _{IC} = 0, | Common mode | 25°C | | 11 | | | 11 | | pF |
| • | • | See Figure 5 | Differential | 25°C | | 2.5 | | | 2.5 | | • |
| z _o | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| | Common-mode | V _{IC} = V _{ICR} min | ١, | 25°C | 70 | 89 | | 70 | 89 | | |
| CMRR | rejection ratio | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 68 | | | 68 | | | dB |
| | Supply-voltage rejection | $V_{CC\pm} = \pm 5 \text{ V t}$ | o ± 15 V, | 25°C | 82 | 99 | | 82 | 99 | | |
| k _{SVR} | ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 80 | | | 80 | | | dB |

[†] Full range is –55°C to 125°C.

 $[\]mbox{$^{\sharp}$}$ *On products compliant to MIL-PRF-38535, Class B, this parameter is not production tested.



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TLE2071M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted)

| | DADAMETED | TEST OF | TEST CONDITIONS | | TLE2071M | | | TL | E2071AI | M | LINUT |
|-----|----------------------|--------------|-----------------------|------------------|----------|-----|-----|------|---------|-----|-------|
| | PARAMETER | IESI CC | SNOTTIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | Completerment | V 0 | Natard | 25°C | 1.35 | 1.6 | 2.2 | 1.35 | 1.6 | 2.2 | A |
| ICC | Supply current | $V_{O} = 0,$ | No load | Full range | | | 2.2 | | | 2.2 | mA |
| | Short-circuit output | V 0 | V _{ID} = 1 V | 0500 | | -35 | | | -35 | | A |
| los | current | $V_O = 0$ | $V_{ID} = -1 V$ | 25°C | | 45 | | | 45 | | mA |

[†] Full range is –55°C to 125°C.

TLE2071M operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 5~V$

| | 24244555 | | IDITIONS | | TL | E2071N | 1 | TLI | E2071A | VI | |
|--------------------|--------------------------------------|--|---|------------------|-----------------|--------|-----------------|-----------------|--------|-----------------|--------------------|
| | PARAMETER | TEST CON | IDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | | | | 25°C | | 35 | | | 35 | | |
| SR+ | Positive slew rate | $V_{O(PP)} = \pm 2.3 \text{ V}$ | , , D | Full range | 20 [‡] | | | 20 [‡] | | | V/μs |
| | | $A_{VD} = -1,$ $C_{L} = 100 \text{ pF},$ | | 25°C | | 38 | | | 38 | | |
| SR- | Negative slew rate | 12 11 7 | 3 | Full range | 20 [‡] | | | 20 [‡] | | | V/μs |
| ts | Settling time | $A_{VD} = -1,$ 2-V step, | To 10 mV | 25°C | | 0.25 | | | 0.25 | | μs |
| is | Setting time | $R_L = 1 \text{ k}\Omega$, $C_L = 100 \text{ pF}$ | To 1 mV | 25 0 | | 0.4 | | | 0.4 | | μδ |
| V | Equivalent input noise | | f = 10 Hz | 25°C | | 48 | 85 [‡] | | 48 | 85 [‡] | nV/√ Hz |
| V _n | voltage | | f = 10 kHz | 25°C | | 12 | 17 [‡] | | 12 | 17 [‡] | IIV/VIIZ |
| ļ., | Peak-to-peak equivalent | $R_S = 20 \Omega$, See Figure 3 | f = 10 Hz to 10 kHz | 0500 | | 6 | | | 6 | | ., |
| V _{N(PP)} | input noise voltage | | f = 0.1 Hz to 10 Hz | 25°C | | 0.6 | | | 0.6 | | μV |
| In | 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 | $V_{O(PP)} = 5 \text{ V},$ f = 1 kHz, $R_S = 25 \Omega$ | $A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$ | 25°C | 0 | .013% | | 0 | .013% | | |
| B ₁ | Unity-gain bandwidth | $V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$ | $R_L = 2 kΩ$, See Figure 2 | 25°C | | 9.4 | | | 9.4 | | MHz |
| ВОМ | Maximum output-swing bandwidth | $V_{O(PP)} = 4 \text{ V},$ $R_L = 2 \text{ k}\Omega$, | $A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$ | 25°C | | 2.8 | | | 2.8 | | MHz |
| φ _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° | | |

 $^{^{\}dagger}$ Full range is -55° C to 125 $^{\circ}$ C.



 $[\]ensuremath{^{\ddagger}}$ *On products compliant to MIL-PRF-38535, Class B, this parameter is not production tested.

TLE2071M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 15 V (unless otherwise noted)

| | 24244555 | | NEITIONO | | Т | LE2071 | И | TL | E2071A | M | |
|------------------|---|--|----------------------------|------------------|-------------------|-------------------|-----|-------------------|-------------------|-----|-------|
| | PARAMETER | I EST CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| ., | leaved offered college | | | 25°C | | 0.49 | 4 | | 0.47 | 2 | |
| V_{IO} | Input offset voltage | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 9.2 | | | 7.2 | mV |
| α_{VIO} | Temperature coefficient of input offset voltage | $R_S = 50 \Omega$ | | Full range | | 3.2 | 29* | | 3.2 | 29* | μV/°C |
| | | | | 25°C | | 6 | 100 | | 6 | 100 | pА |
| l _{IO} | Input offset current | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 20 | | | 20 | nA |
| | | See Figure 4 | | 25°C | | 20 | 175 | | 20 | 175 | pА |
| I _{IB} | Input bias current | | | Full range | | | 60 | | | 60 | nA |
| v | Common-mode input | B 500 | | 25°C | 15 to –11 | 15 to –11.9 | | 15 to –11 | 15 to -11.9 | | ٧ |
| V _{ICR} | voltage range | $R_S = 50 \Omega$ | | Full range | 15 to -10.9 | | | 15 to -10.9 | | | V |
| | | $I_{O} = -200 \mu A$ | | 25°C | 13.8 | 14.1 | | 13.8 | 14.1 | | |
| | | 10 = -200 μΑ | | Full range | 13.6 | | | 13.6 | | | |
| V _{OM+} | Maximum positive peak | $I_{O} = -2 \text{ mA}$ | | 25°C | 13.5 | 13.9 | | 13.5 | 13.9 | | V |
| V OM + | output voltage swing | 10 = -2 111A | | Full range | 13.3 | | | 13.3 | | | • |
| | | $I_0 = -20 \text{ mA}$ | | 25°C | 11.5 | 12.3 | | 11.5 | 12.3 | | |
| | | 10 = -20 IIIA | | Full range | 11.4 | | | 11.4 | | | |
| | | I _O = 200 μA | | 25°C | -13.8 | -14.2 | | -13.8 | -14.2 | | |
| | | 10 = 200 μΑ | | Full range | -13.6 | | | -13.6 | | | |
| \ <i>/</i> | Maximum negative peak | 1 - 2 m 4 | | 25°C | -13.5 | -14 | | -13.5 | -14 | | V |
| V_{OM-} | output voltage swing | $I_O = 2 \text{ mA}$ | | Full range | -13.3 | | | -13.3 | | | V |
| | | | | 25°C | -11.5 | -12.4 | | -11.5 | -12.4 | | |
| | | $I_O = 20 \text{ mA}$ | | Full range | -11.4 | | | -11.4 | | | |
| | | | B 000 0 | 25°C | 80 | 96 | | 80 | 96 | | |
| | | | $R_L = 600 \Omega$ | Full range | 78 | | | 78 | | | |
| | Large-signal differential | | D 01:0 | 25°C | 90 | 109 | | 90 | 109 | | -10 |
| A_{VD} | voltage amplification | $V_0 = \pm 10 \text{ V}$ | $R_L = 2 k\Omega$ | Full range | 88 | | | 88 | | | dB |
| | | | 5 4810 | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | $R_L = 10 \text{ k}\Omega$ | Full range | 93 | | | 93 | | | |
| rį | Input resistance | V _{IC} = 0 | | 25°C | | 10 ¹² | | | 10 ¹² | | Ω |
| c _i | Input capacitance | V _{IC} = 0, | Common mode | 25°C | | 7.5 | | | 7.5 | | pF |
| | . , | See Figure 5 | Differential | 25°C | | 2.5 | | | 2.5 | | · |
| z _o | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| <u> </u> | Common-mode | V _{IC} = V _{ICR} mir | າ, | 25°C | 80 | 98 | | 80 | 98 | | |
| CMRR | rejection ratio | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 78 | | | 78 | | | dB |
| | Supply-voltage rejection | $V_{CC\pm} = \pm 5 \text{ V}$ | to ±15 V. | 25°C | 82 | 99 | | 82 | 99 | | |
| k _{SVR} | ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 80 | | | 80 | | | dB |
| | | | | | • | | | | | | |

^{*}On products compliant to MIL-PRF-38535, Class B, this parameter is not production tested.

† Full range is -55°C to 125°C.



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TLE2071M electrical characteristics at specified free-air temperature, V_{CC^\pm} = ± 15 V (unless otherwise noted) (continued)

| | DADAMETED | TEST CONDITIONS | | _ + | TLE2071M | | | TL | E2071A | М | UNIT | |
|-----|--|-----------------|------------------------|------------------|------------|-----|-----|------|--------|-----|------|----|
| | PARAMETER | | | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | ONIT | |
| | Owner by summer to | ., . | N. I. | 25°C | 1.35 | 1.7 | 2.2 | 1.35 | 1.7 | 2.2 | | |
| ICC | Supply current | $V_{O} = 0,$ | No load | No load | Full range | | | 2.2 | | | 2.2 | mA |
| | Object since it seeks at severe | ., . | $V_{ID} = 1 V$ | 0500 | -30 | -45 | | -30 | -45 | | | |
| los | I _{OS} Short-circuit output current | $V_O = 0$ | V _{ID} = -1 V | 25°C | 30 | 48 | | 30 | 48 | | mA | |

[†] Full range is -55°C to 125°C.

TLE2071M operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15~V$

| | 24244555 | | 101710110 | | TL | .E2071N | 1 | TL | E2071A | М | |
|--------------------|--------------------------------------|---|---|------------------|------|---------|-----|------|--------|-----|--------------------|
| | PARAMETER | TEST CON | IDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | | | | 25°C | 30 | 40 | | 30 | 40 | | |
| SR+ | Positive slew rate | $V_{O(PP)} = 10 \text{ V},$ | | Full range | 22 | | | 22 | | | V/μs |
| | | $R_L = 2 k\Omega$, See Figure 1 | $C_L = 100 \text{ pF},$ | 25°C | 30 | 45 | | 30 | 45 | | |
| SR- | Negative slew rate | 3. I | | Full range | 22 | | | 22 | | | V/μs |
| + | Settling time | $A_{VD} = -1,$ 10-V step, | To 10 mV | 25°C | | 0.4 | | | 0.4 | | μs |
| t _s | Setting time | $R_L = 1 \text{ k}\Omega$, $C_L = 100 \text{ pF}$ | To 1 mV | 25 0 | | 1.5 | | | 1.5 | | μ5 |
| | Equivalent input noise | | f = 10 Hz | 25°C | | 48 | 85* | | 48 | 85* | nV/√ Hz |
| V _n | voltage | | f = 10 kHz | 25°C | | 12 | 17* | | 12 | 17* | IIV/VIIZ |
| ļ., | Peak-to-peak equivalent | $R_S = 20 \Omega$, See Figure 3 | f = 10 Hz to 10 kHz | 2502 | | 6 | | | 6 | | ., |
| V _{N(PP)} | input noise voltage | | f = 0.1 Hz to 10 Hz | 25°C | | 0.6 | | | 0.6 | | μV |
| In | 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 | $V_{O(PP)} = 20 \text{ V},$ f = 1 kHz, $R_S = 25 \Omega$ | $A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$ | 25°C | 0 | .008% | | 0 | .008% | | |
| B ₁ | Unity-gain bandwidth | $V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$ | $R_L = 2 kΩ$, See Figure 2 | 25°C | 8* | 10 | | 8* | 10 | | MHz |
| B _{OM} | Maximum output-swing bandwidth | $V_{O(PP)} = 20 \text{ V},$ $R_L = 2 \text{ k}\Omega,$ | $A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$ | 25°C | 478* | 637 | | 478* | 637 | | kHz |
| φ _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° | _ | |

^{*}On products compliant to MIL-PRF-38535, Class B, this parameter is not production tested.



[†] Full range is –55°C to 125°C.

TLE2071Y electrical characteristics at V_{CC^\pm} = ± 15 V, T_A = $25^{\circ}C$

| | DADAMETED | | CT CONDIT | IONG | Т | LE2071\ | 1 | |
|------------------|--|--|----------------------------|---------------------|-----------------|------------------|-----|------|
| | PARAMETER | '5 | ST CONDIT | IONS | MIN | TYP | MAX | UNIT |
| V _{IO} | Input offset voltage | $V_{IC} = 0$, | $V_{O} = 0$, | $R_S = 50 \Omega$ | | 0.49 | 4 | mV |
| I _{IO} | Input offset current | | | | | 6 | 100 | pА |
| I _{IB} | Input bias current | $V_{IC} = 0$, | $V_{O}=0$, | See Figure 4 | | 20 | 175 | pА |
| V _{ICR} | Common-mode input voltage range | $R_S = 50 \Omega$ | | | 15 to –11 | 15 to 11.9 | | V |
| | | $I_{O} = -200 \mu A$ | | | 13.8 | 14.1 | | |
| V _{OM+} | Maximum positive peak output voltage swing | $I_0 = -2 \text{ mA}$ | | | 13.5 | 13.9 | | V |
| | | $I_O = -20 \text{ mA}$ | | | 11.5 | 12.3 | | |
| | | $I_{O} = 200 \mu A$ | | | -13.8 | -14.2 | | |
| V_{OM-} | Maximum negative peak output voltage swing | I _O = 2 mA | | | -13.5 | -14 | | V |
| | | I _O = 20 mA | | | -11.5 | -12.4 | | |
| | | | R _L = 600 Ω | 2 | 80 | 96 | | |
| A_{VD} | Large-signal differential voltage amplification | V _O = ±10 V | $R_L = 2 k\Omega$ | | 90 | 109 | | dB |
| | | | $R_L = 10 \text{ k}\Omega$ | 2 | 95 | 118 | | |
| rį | Input resistance | $V_{IC} = 0$ | | | | 10 ¹² | | Ω |
| | | $V_{O} = 0$, | Common r | node | | 7.5 | | |
| c _i | Input capacitance | See Figure 5 | Differentia | | | 2.5 | | pF |
| z _o | Open-loop output impedance | f = 1 MHz | • | | | 80 | | Ω |
| CMRR | Common-mode rejection ratio | $V_{IC} = V_{ICR}min,$ $R_S = 50 \Omega$ | | V _O = 0, | 80 | 98 | | dB |
| k _{SVR} | Supply-voltage rejection ratio ($\Delta V_{CC^{\pm}}/\Delta V_{IO}$) | $V_{CC\pm} = \pm 5 \text{ V to}$ $R_S = 50 \Omega$ | ±15 V, | V _O = 0, | 82 | 99 | | dB |
| I _{CC} | Supply current | $V_O = 0$, | No load | | 1.35 | 1.7 | 2.2 | mA |
| | Object allowed and a second | ., . | V _{ID} = 1 V | | -30 | -45 | | |
| los | Short-circuit output current | $V_O = 0$ | $V_{ID} = -1 V$ | 1 | 30 | 48 | | mA |

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TLE2072C electrical characteristics at specified free-air temperature, V_{CC^\pm} = ± 5 V (unless otherwise noted)

| | DADAMETED | TEOT 00 | NDITIONO | | TL | E20720 | ; | TL | E2072A | С | |
|------------------|---|---|----------------------------|------------------|-----------------|------------------|-----|-----------------|------------------|-----|-------|
| | PARAMETER | TEST CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| V | Input offset voltage | | | 25°C | | 0.9 | 6 | | 0.65 | 3.5 | mV |
| V _{IO} | Input offset voltage | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 7.8 | | | 5.3 | IIIV |
| α_{VIO} | Temperature coefficient of input offset voltage | $R_S = 50 \Omega$ | | Full range | | 2.3 | 25 | | 2.3 | 25 | μV/°C |
| | Innut effect ourrent | | | 25°C | | 5 | 100 | | 5 | 100 | pА |
| I _{IO} | Input offset current | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 1.4 | | | 1.4 | nA |
| , | lanut biog gurrant | See Figure 4 | | 25°C | | 15 | 175 | | 15 | 175 | pА |
| I _{IB} | Input bias current | | | Full range | | | 5 | | | 5 | nA |
| V | Common-mode input | R _S = 50 Ω | | 25°C | 5 to –1 | 5 to –1.9 | | 5 to -1 | 5 to –1.9 | | ٧ |
| V _{ICR} | voltage range | n _S = 50 12 | | Full range | 5 to -0.9 | | | 5 to -0.9 | | | V |
| | | | | 25°C | 3.8 | 4.1 | | 3.8 | 4.1 | | |
| | | $I_{O} = -200 \mu\text{A}$ | | Full range | 3.7 | | | 3.7 | | | |
| ., | Maximum positive peak | | | 25°C | 3.5 | 3.9 | | 3.5 | 3.9 | | V |
| V _{OM+} | output voltage swing | $I_0 = -2 \text{ mA}$ | | Full range | 3.4 | | | 3.4 | | | V |
| | | 1 00 m A | | 25°C | 1.5 | 2.3 | | 1.5 | 2.3 | | |
| | | $I_O = -20 \text{ mA}$ | | Full range | 1.5 | | | 1.5 | | | |
| | | L = 200 ··· A | | 25°C | -3.8 | -4.2 | | -3.8 | -4.2 | | |
| | | $I_{O} = 200 \mu\text{A}$ | | Full range | -3.7 | | | -3.7 | | | |
| ٠, | Maximum negative peak | | | 25°C | -3.5 | -4.1 | | -3.5 | -4.1 | | ٧ |
| V_{OM-} | output voltage swing | $I_O = 2 \text{ mA}$ | | Full range | -3.4 | | | -3.4 | | | V |
| | | | | 25°C | -1.5 | -2.4 | | -1.5 | -2.4 | | |
| | | $I_O = 20 \text{ mA}$ | | Full range | -1.5 | | | -1.5 | | | |
| | | | D 600.0 | 25°C | 80 | 91 | | 80 | 91 | | |
| | | | $R_L = 600 \Omega$ | Full range | 79 | | | 79 | | | |
| ^ | Large-signal differential | \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ | D 010 | 25°C | 90 | 100 | | 90 | 100 | | dB |
| A _{VD} | voltage amplification | $V_0 = \pm 2.3 \text{ V}$ | $R_L = 2 k\Omega$ | Full range | 89 | | | 89 | | | uБ |
| | | | D 401-0 | 25°C | 95 | 106 | | 95 | 106 | | |
| | | | $R_L = 10 \text{ k}\Omega$ | 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, | Common mode | 25°C | | 11 | | | 11 | | pF |
| | <u> </u> | See Figure 5 | Differential | 25°C | | 2.5 | | | 2.5 | | |
| z _o | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| OMBB | Common-mode | V _{IC} = V _{ICR} min, | 25°C | 70 | 89 | | 70 | 89 | | į | |
| CMRR | rejection ratio | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 68 | | | 68 | | | dB |
| | Supply-voltage rejection | | 25°C | 82 | 99 | | 82 | 99 | | d D | |
| k _{SVR} | ratio($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 80 | | | 80 | | | dB |

[†] Full range is 0°C to 70°C.



TLE2072C electrical characteristics at specified free-air temperature, $V_{CC\pm}=\pm 5~V$ (unless otherwise noted) (continued)

| | PARAMETER | | TEST CONDITIONS | | TLE2072C | | | TL | С | | |
|----------------|-----------------------|---------------------------------------|-------------------|----------------|----------|-----|-----|-----|-----|-----|------|
| | PARAMETER | TEST CO | INDITIONS | T _A | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | Supply current | \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ | Noteed | 25°C | 2.7 | 2.9 | 3.9 | 2.7 | 2.9 | 3.9 | A |
| ICC | (both channels) | $V_{O} = 0$, | No load | Full range | | | 3.9 | | | 3.9 | mA |
| a _x | Crosstalk attenuation | $V_{IC} = 0$, | $R_L = 2 k\Omega$ | 25°C | | 120 | | | 120 | | dB |
| | Short-circuit output | \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ | $V_{ID} = 1 V$ | 0500 | | -35 | | | -35 | | A |
| los | current | $V_O = 0$ | $V_{ID} = -1 V$ | 25°C | | 45 | | | 45 | | mA |

TLE2072C operating characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm5~\text{V}$

| | | | | | 1 | ΓLE20720 |) | Т | LE2072A | С | |
|--------------------|--|--|--|------------------|-----|----------|-----|-----|---------|-----|--------------------|
| | PARAMETER | TEST CON | IDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | | | | 25°C | | 35 | | | 35 | | |
| SR+ | Positive slew rate | $V_{O(PP)} = \pm 2.3 \text{ V}$ | | Full range | 22 | | | 22 | | | V/μs |
| | | $A_{VD} = -1,$ $C_{L} = 100 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 1 | 25°C | | 38 | | | 38 | | |
| SR- | Negative slew rate | | 3 | Full range | 22 | | | 22 | | | V/μs |
| | Settling time | $A_{VD} = -1$, 2-V step, | To 10 mV | 25°C | | 0.25 | | | 0.25 | | |
| t _s | Settling time | $R_L = 1 \text{ k}\Omega,$ $C_L = 100 \text{ pF}$ | To 1 mV | 25 C | | 0.4 | | | 0.4 | | μs |
| | Equivalent input noise | | f = 10 Hz | 25°C | | 48 | 85 | | 48 | 85 | nV/√ Hz |
| V _n | voltage | | f = 10 kHz | 25°C | | 12 | 17 | | 12 | 17 | IIV/∀⊓Z |
| ,, | Peak-to-peak equiva- | $R_S = 20 \Omega$, See Figure 3 | f = 10 Hz to 10 kHz | 0500 | | 6 | | | 6 | | ., |
| V _{N(PP)} | lent input noise voltage | | f = 0.1 Hz to 10 Hz | 25°C | | 0.6 | | | 0.6 | | μV |
| In | Equivalent input noise current | V _{IC} = 0, | f = 10 kHz | 25°C | | 2.8 | | | 2.8 | | fA/√ Hz |
| THD + N | Total harmonic distor- tion plus noise | $V_{O(PP)} = 5 \text{ V},$ f = 1 kHz, $R_S = 25 \Omega$ | $A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$ | 25°C | | 0.013% | | | 0.013% | | |
| B ₁ | Unity-gain bandwidth | $V_{I} = 10 \text{ mV},$ $C_{L} = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | | 9.4 | | | 9.4 | | MHz |
| B _{OM} | Maximum output-swing bandwidth | $V_{O(PP)} = 4 \text{ V},$ $R_L = 2 \text{ k}\Omega$, | $A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$ | 25°C | | 2.8 | | | 2.8 | | MHz |
| фm | 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.

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TLE2072C electrical characteristics at specified free-air temperature, V_{CC^\pm} = ± 15 V (unless otherwise noted)

| | DADAMETED | TEST CO | NDITIONS | | Т | LE20720 | | TL | E2072A | С | UNIT |
|-----------------------|---|--|----------------------------|------------------|-------------------|-------------------|-----|-------------------|-------------------|-----|-------|
| | PARAMETER | TEST CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| V | Input offeet voltage | | | 25°C | | 1.1 | 6 | | 0.7 | 3.5 | m\/ |
| V_{IO} | Input offset voltage | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 7.8 | | | 5.3 | mV |
| α_{VIO} | Temperature coefficient of input offset voltage | $R_S = 50 \Omega$ | | Full range | | 2.4 | 25 | | 2.4 | 25 | μV/°C |
| | lowed affect accommons | | | 25°C | | 6 | 100 | | 6 | 100 | pА |
| I _{IO} | Input offset current | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 1.4 | | | 1.4 | nA |
| | lament bing assument | See Figure 4 | | 25°C | | 20 | 175 | | 20 | 175 | pА |
| I _{IB} | Input bias current | | | Full range | | | 5 | | | 5 | nA |
| V | Common-mode input | R _S = 50 Ω | | 25°C | 15 to –11 | 15 to –11.9 | | 15 to –11 | 15 to –11.9 | | ٧ |
| V _{ICR} | voltage range | ng = 50 12 | | Full range | 15 to –10.9 | | | 15 to -10.9 | | | V |
| | | $I_{O} = -200 \mu A$ | | 25°C | 13.8 | 14.1 | | 13.8 | 14.1 | | |
| | | 10 = 200 μ/τ | | Full range | 13.6 | | | 13.6 | | | |
| V _{OM+} | Maximum positive peak | $I_O = -2 \text{ mA}$ | | 25°C | 13.5 | 13.9 | | 13.5 | 13.9 | | ٧ |
| V OIVI + | output voltage swing | 10 - 2117 | | Full range | 13.4 | | | 13.4 | | | ľ |
| | | $I_0 = -20 \text{ mA}$ | | 25°C | 11.5 | 12.3 | | 11.5 | 12.3 | | |
| | | 10 = 2011// | | Full range | 11.5 | | | 11.5 | | | |
| | | I _O = 200 μA | | 25°C | -13.8 | -14.2 | | -13.8 | -14.2 | | |
| | | 10 = 200 μ/τ | | Full range | -13.7 | | | -13.7 | | | |
| V_{OM-} | Maximum negative peak | I _O = 2 mA | | 25°C | -13.5 | -14 | | -13.5 | -14 | | V |
| VOM – | output voltage swing | 10 – 2 1117 | | Full range | -13.4 | | | -13.4 | | | |
| | | I _O = 20 mA | | 25°C | -11.5 | -12.4 | | -11.5 | -12.4 | | |
| | | 10 = 20 111A | _ | Full range | -11.5 | | | -11.5 | | | |
| | | | $R_L = 600 \Omega$ | 25°C | 80 | 96 | | 80 | 96 | | |
| | | | 11[= 000 32 | Full range | 79 | | | 79 | | | |
| Δ | Large-signal differential | V _O = ±10 V | $R_L = 2 k\Omega$ | 25°C | 90 | 109 | | 90 | 109 | | dB |
| A_{VD} | voltage amplification | VO = ±10 V | 11[- 2 K32 | Full range | 89 | | | 89 | | | ub. |
| | | | $R_L = 10 \text{ k}\Omega$ | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | 11[= 10 K22 | Full range | 94 | | | 94 | | | |
| rį | Input resistance | $V_{IC} = 0$ | | 25°C | | 10 ¹² | | | 10 ¹² | | Ω |
| Ci | Input capacitance | V _{IC} = 0, | Common mode | 25°C | | 7.5 | | | 7.5 | | pF |
| | <u> </u> | See Figure 5 | Differential | 25°C | | 2.5 | | | 2.5 | | |
| z _o | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| 01455 | Common-mode | V _{IC} = V _{ICR} mir | ١, | 25°C | 80 | 98 | | 80 | 98 | | |
| CMRR | rejection ratio | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 79 | | | 79 | | | dB |
| 1. | Supply-voltage rejection | $V_{CC\pm} = \pm 5 \text{ V}$ | to ±15 V, | 25°C | 82 | 99 | | 82 | 99 | | , in |
| k _{SVR} | ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 81 | | | 81 | | | dB |

[†] Full range is 0°C to 70°C.



TLE2072C electrical characteristics at specified free-air temperature, V_{CC^\pm} = ± 15 V (unless otherwise noted) (continued)

| | PARAMETER | TF0T 00 | TEST CONDITIONS | | TLE2072C | | | TL | С | | |
|----------------|--------------------------------|----------------|-------------------|----------------|----------|-----|-----|-----|-----|-----|------|
| | PARAMETER | IESI CO | NUTTIONS | T _A | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | Supply current | V 0 | No local | 25°C | 2.7 | 3.1 | 3.9 | 2.7 | 3.1 | 3.9 | A |
| ICC | (both channels) | $V_{O} = 0$, | No load | Full range | | | 3.9 | | | 3.9 | mA |
| a _x | Crosstalk attenuation | $V_{IC} = 0$, | $R_L = 2 k\Omega$ | 25°C | | 120 | | | 120 | | dB |
| | Object since it as too to some | ., . | $V_{ID} = 1 V$ | 0500 | -30 | -45 | | -30 | -45 | | |
| los | Short-circuit output current | $V_O = 0$ | $V_{ID} = -1 V$ | 25°C | 30 | 48 | | 30 | 48 | | mA |

TLE2072C operating characteristics at specified free-air temperature, V_{CC^\pm} = $\pm 15~V$

| | | | IDITIONS | | 1 | ΓLE20720 | | Т | LE2072A | 2 | |
|--------------------|--------------------------------------|---|--|------------------|-----|----------|-----|-----|---------|-----|--------------------|
| | PARAMETER | TEST CON | IDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | | | | 25°C | 28 | 40 | | 28 | 40 | | |
| SR+ | Positive slew rate | $V_{O(PP)} = 10 \text{ V},$ | D 0k0 | Full range | 25 | | | 25 | | | V/μs |
| | | $A_{VD} = -1,$ $C_{I} = 100 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 1 | 25°C | 30 | 45 | | 30 | 45 | | |
| SR- | Negative slew rate | | <u> </u> | Full range | 25 | | | 25 | | | V/μs |
| + | Settling time | $A_{VD} = -1,$ 10-V step, | To 10 mV | 25°C | | 0.4 | | | 0.4 | | μS |
| t _s | Settling time | $R_L = 1 k\Omega$, $C_L = 100 pF$ | To 1 mV | 25 0 | | 1.5 | | | 1.5 | | μδ |
| V _n | Equivalent input noise | | f = 10 Hz | 25°C | | 48 | 85 | | 48 | 85 | nV/√ Hz |
| v _n | voltage | | f = 10 kHz | 25°C | | 12 | 17 | | 12 | 17 | IIV/VIIZ |
| ,, | Peak-to-peak | $R_S = 20 \Omega$, See Figure 3 | f = 10 Hz to 10 kHz | 0500 | | 6 | | | 6 | | ., |
| V _{N(PP)} | equivalent input noise voltage | | f = 0.1 Hz to 10 Hz | 25°C | | 0.6 | | | 0.6 | | μV |
| In | 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 | $V_{O(PP)} = 20 \text{ V},$ f = 1 kHz, $R_S = 25 \Omega$ | $A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$ | 25°C | | 0.008% | | | 0.008% | | |
| B ₁ | Unity-gain bandwidth | $V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | 8 | 10 | | 8 | 10 | | MHz |
| B _{OM} | Maximum output-swing bandwidth | $V_{O(PP)} = 20 \text{ V},$ $R_L = 2 \text{ k}\Omega,$ | $A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$ | 25°C | 478 | 637 | | 478 | 637 | | kHz |
| φ _m | Phase margin at unity gain | $V_{I} = 10 \text{ mV},$ $C_{L} = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | _ | 57° | _ | _ | 57° | _ | _ |

[†] Full range is 0°C to 70°C.

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TLE2072I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted)

| | | | NEUTIONO | | Т | LE2072I | | TL | E2072A | 1 | |
|-----------------------|---|--|----------------------------|------------------|-----------------|------------------|-----|-----------------|------------------|-----|----------------|
| | PARAMETER | IESI CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| v | Innut offeet veltage | | | 25°C | | 0.9 | 6 | | 0.65 | 3.5 | m)/ |
| V_{IO} | Input offset voltage | | $V_{O} = 0$, | Full range | | | 9.1 | | | 6.4 | mV |
| α_{VIO} | Temperature coefficient of input offset voltage | $R_S = 50 \Omega$, | | Full range | | 2.4 | 25 | | 2.4 | 25 | μV/°C |
| | love to the standard | | | 25°C | | 5 | 100 | | 5 | 100 | pА |
| I _{IO} | Input offset current | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 5 | | | 5 | nA |
| | In most hill a summer t | See Figure 4 | | 25°C | | 15 | 175 | | 15 | 175 | pА |
| I _{IB} | Input bias current | | | Full range | | | 10 | | | 10 | nA |
| V | Common-mode input | B 50 O | | 25°C | 5 to –1 | 5 to –1.9 | | 5 to –1 | 5 to –1.9 | | ٧ |
| V _{ICR} | voltage range | $R_S = 50 \Omega$ | | Full range | 5 to -0.8 | | | 5 to -0.8 | | | V |
| | | $I_{O} = -200 \mu\text{A}$ | | 25°C | 3.8 | 4.1 | | 3.8 | 4.1 | | |
| | | -10 = 200 μ/τ | | Full range | 3.7 | | | 3.7 | | | |
| V _{OM+} | Maximum positive peak | $I_O = -2 \text{ mA}$ | | 25°C | 3.5 | 3.9 | | 3.5 | 3.9 | | V |
| • OIVI + | output voltage swing | -0 = | | Full range | 3.4 | | | 3.4 | | | |
| | | $I_{O} = -20 \text{ mA}$ | | 25°C | 1.5 | 2.3 | | 1.5 | 2.3 | | |
| | | 10 = 2011#1 | | Full range | 1.5 | | | 1.5 | | | |
| | | I _O = 200 μA | | 25°C | -3.8 | -4.2 | | -3.8 | -4.2 | | |
| | | 10 = 200 μ/ (| | Full range | -3.7 | | | -3.7 | | | |
| V_{OM-} | Maximum negative peak | I _O = 2 mA | | 25°C | -3.5 | -4.1 | | -3.5 | -4.1 | | V |
| * OIVI – | output voltage swing | .0 = 2 | | Full range | -3.4 | | | -3.4 | | | · |
| | | I _O = 20 mA | | 25°C | -1.5 | -2.4 | | -1.5 | -2.4 | | |
| | | 10 = 20 11171 | , | Full range | -1.5 | | | -1.5 | | | |
| | | | $R_L = 600 \Omega$ | 25°C | 80 | 91 | | 80 | 91 | | |
| | | | 11_ 000 11 | Full range | 79 | | | 79 | | | |
| A_{VD} | Large-signal differential | $V_0 = \pm 2.3 \text{ V}$ | $R_L = 2 k\Omega$ | 25°C | 90 | 100 | | 90 | 100 | | dB |
| , vD | voltage amplification | VO = <u>12</u> .0 V | 11 - 2 1/32 | Full range | 89 | | | 89 | | | u _D |
| | | | $R_L = 10 \text{ k}\Omega$ | 25°C | 95 | 106 | | 95 | 106 | | |
| | | | 11[= 10 K22 | Full range | 94 | | | 94 | | | |
| rį | Input resistance | $V_{IC} = 0$ | | 25°C | | 10 ¹² | | | 10 ¹² | | Ω |
| Ci | Input capacitance | V _{IC} = 0, | Common mode | 25°C | | 11 | | | 11 | | pF |
| | | See Figure 5 | Differential | 25°C | | 2.5 | | | 2.5 | | |
| z _o | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| 01155 | Common-mode | V _{IC} = V _{ICR} mir | ١, | 25°C | 70 | 89 | | 70 | 89 | | .:5 |
| CMRR | rejection ratio | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 68 | | | 68 | | | dB |
| | Supply-voltage rejection | $V_{CC\pm} = \pm 5 \text{ V}$ | to ±15 V. | 25°C | 82 | 99 | | 82 | 99 | | |
| k_{SVR} | ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 80 | | | 80 | | | dB |

[†] Full range is –40°C to 85°C.



TLE2072I electrical characteristics at specified free-air temperature, $V_{CC^\pm}\!=\!\pm 5$ V (unless otherwise noted) (continued)

| | DADAMETED | TEOT O | TEST CONDITIONS | | TLE2072I | | | TL | Al . | | |
|----------------|------------------------------|--------------------|-----------------------|----------------|----------|-----|-----|-----|------|-----|------|
| | PARAMETER | IESI CO | ONDITIONS | T _A | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| 1 | Supply current | V 0 | No load | 25°C | 2.7 | 2.9 | 3.9 | 2.7 | 2.9 | 3.9 | mA |
| Icc | (both channels) | $V_{O} = 0$, | No load | Full range | | | 3.9 | | | 3.9 | IIIA |
| a _x | Crosstalk attenuation | $V_{IC} = 0$, | $R_L = 2 k\Omega$ | 25°C | | 120 | | | 120 | | dB |
| | Chart sive it autout august | V 0 | V _{ID} = 1 V | 0500 | | -35 | | | -35 | | A |
| los | Short-circuit output current | v _O = 0 | $V_{ID} = -1 V$ | 25°C | | 45 | | | 45 | | mA |

TLE2072I operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 5~V$

| | | | | | | TLE2072I | | Т | LE2072A | I | |
|--------------------|--------------------------------------|--|--|------------------|-----|----------|-----|-----|---------|-----|--------------------|
| | PARAMETER | TEST CON | IDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | | | | 25°C | | 35 | | | 35 | | |
| SR+ | Positive slew rate | $V_{O(PP)} = \pm 2.3 \text{ V}$ | | Full range | 20 | | | 20 | | | V/μs |
| | | $A_{VD} = -1,$ $C_{L} = 100 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 1 | 25°C | | 38 | | | 38 | | |
| SR- | Negative slew rate | | 3 | Full range | 20 | | | 20 | | | V/μs |
| t _s | Settling time | $A_{VD} = -1$, 2-V step, | To 10 mV | 25°C | | 0.25 | | | 0.25 | | 116 |
| is | Settling time | $R_L = 1 \text{ k}\Omega$, $C_L = 100 \text{ pF}$ | To 1 mV | 25 C | | 0.4 | | | 0.4 | | μs |
| | Equivalent input noise | | f = 10 Hz | 25°C | | 48 | 85 | | 48 | 85 | nV/√ Hz |
| V _n | voltage | | f = 10 kHz | 25 C | | 12 | 17 | | 12 | 17 | IIV/VIIZ |
| ,, | Peak-to-peak | $R_S = 20 \Omega$, See Figure 3 | f = 10 Hz to 10 kHz | 0500 | | 6 | | | 6 | | ., |
| V _{N(PP)} | equivalent input noise voltage | | f = 0.1 Hz to 10 Hz | 25°C | | 0.6 | | | 0.6 | | μV |
| In | 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 | $V_{O(PP)} = 5 \text{ V},$ f = 1 kHz, $R_S = 25 \Omega$ | $A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$ | 25°C | | 0.013% | | | 0.013% | | |
| B ₁ | Unity-gain bandwidth | $V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | | 9.4 | | | 9.4 | | MHz |
| B _{OM} | Maximum output- swing bandwidth | $V_{O(PP)} = 4 \text{ V},$ $R_L = 2 \text{ k}\Omega$, | $A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$ | 25°C | | 2.8 | | | 2.8 | | MHz |
| φ _m | Phase margin at unity gain | $V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$ | $R_L = 2 kΩ$, See Figure 2 | 25°C | | 56° | | | 56° | | |

[†] Full range is 40°C to 85°C.

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TLE2072I electrical characteristics at specified free-air temperature, V_{CC^\pm} = ± 15 V (unless otherwise noted)

| | DADAMETED | TEST CONDITIONS | | Т | LE2072 | | TL | E2072A | d . | | |
|-----------------------|---|--|----------------------------|------------------|-------------------|-------------------|-----|-------------------|-------------------|-----|------------|
| | PARAMETER | TEST CO | NUTTIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| V | logest offeet valtage | | | 25°C | | 1.1 | 6 | | 0.7 | 3.5 | \ <i>(</i> |
| V _{IO} | Input offset voltage | | $V_{O} = 0$, | Full range | | | 9.1 | | | 6.4 | mV |
| α_{VIO} | Temperature coefficient of input offset voltage | $R_S = 50 \Omega$, | | Full range | | 2.4 | 25 | | 2.4 | 25 | μV/°C |
| | land the offers of a common to | | | 25°C | | 6 | 100 | | 6 | 100 | pА |
| I _{IO} | Input offset current | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 5 | | | 5 | nA |
| | Input biog gurrent | See Figure 4 | | 25°C | | 20 | 175 | | 20 | 175 | pА |
| I _{IB} | Input bias current | | | Full range | | | 10 | | | 10 | nA |
| V | Common-mode input | $R_S = 50 \Omega$ | | 25°C | 15 to –11 | 15 to –11.9 | | 15 to –11 | 15 to –11.9 | | ٧ |
| V _{ICR} | voltage range | ng = 30 12 | | Full range | 15 to –10.8 | | | 15 to -10.8 | | | V |
| | | I _O = -200 μA | | 25°C | 13.8 | 14.1 | | 13.8 | 14.1 | | |
| | | 10 = -200 μΑ | | Full range | 13.7 | | | 13.7 | | | |
| V | Maximum positive peak | I _O = -2 mA | | 25°C | 13.5 | 13.9 | | 13.5 | 13.9 | | V |
| V _{OM+} | output voltage swing | 10 = -2 IIIA | | Full range | 13.4 | | | 13.4 | | | V |
| | | $I_{O} = -20 \text{ mA}$ | | 25°C | 11.5 | 12.3 | | 11.5 | 12.3 | | |
| | | 10 = -20 IIIA | | Full range | 11.5 | | | 11.5 | | | |
| | | I _O = 200 μA | | 25°C | -13.8 | -14.2 | | -13.8 | -14.2 | | |
| | | 10 = 200 μΑ | | Full range | -13.7 | | | -13.7 | | | |
| V_{OM-} | Maximum negative peak | I _O = 2 mA | | 25°C | -13.5 | -14 | | -13.5 | -14 | | V |
| V OIVI – | output voltage swing | 10 = 2 1117 (| | Full range | -13.4 | | | -13.4 | | | · |
| | | I _O = 20 mA | | 25°C | -11.5 | -12.4 | | -11.5 | -12.4 | | |
| | | 10 = 20 11,71 | 1 | Full range | -11.5 | | | -11.5 | | | |
| | | | $R_L = 600 \Omega$ | 25°C | 80 | 96 | | 80 | 96 | | |
| | | | | Full range | 79 | | | 79 | | | |
| A_{VD} | Large-signal differential | V _O = ±10 V | $R_L = 2 k\Omega$ | 25°C | 90 | 109 | | 90 | 109 | | dB |
| · •VD | voltage amplification | | | Full range | 89 | | | 89 | | | |
| | | | $R_L = 10 \text{ k}\Omega$ | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | | Full range | 94 | | | 94 | | | |
| rį | Input resistance | V _{IC} = 0 | | 25°C | | 10 ¹² | | | 10 ¹² | | Ω |
| Ci | Input capacitance | V _{IC} = 0, See Figure 5 | Common mode | 25°C | | 7.5 | | | 7.5 | | pF |
| | | Joe Figure 5 | Differential | 25°C | | 2.5 | | | 2.5 | | |
| Z ₀ | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMBB | Common-mode | V _{IC} = V _{ICR} mir | | 25°C | 80 | 98 | | 80 | 98 | | ٩D |
| CMRR | rejection ratio | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 79 | | | 79 | | | dB |
| le . | Supply-voltage rejection | $V_{CC\pm} = \pm 5 \text{ V}$ | | 25°C | 82 | 99 | | 82 | 99 | | 40 |
| k _{SVR} | ratio $(\Delta V_{CC\pm}/\Delta V_{IO})$ | $V_{O} = 0$, | $R_S = 50 \Omega$ | Full range | 80 | | | 80 | | | dB |

[†] Full range is –40°C to 85°C.



TLE2072I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 15 V (unless otherwise noted) (continued)

| | PARAMETER | TEST CONDITIONS | | _ | TLE2072I | | | TL | VI | | |
|----------------|------------------------------|-----------------|-------------------|----------------|----------|-----|-----|-----|-----|-----|------|
| | PARAMETER | IESI CO | MUITIONS | T _A | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| 1 | Supply current | $V_{O} = 0$, | No load | 25°C | 2.7 | 3.1 | 3.9 | 2.7 | 3.1 | 3.9 | mA |
| Icc | (both channels) | VO = 0, | No load | Full range | | | 3.9 | | | 3.9 | IIIA |
| a _x | Crosstalk attenuation | $V_{IC} = 0$, | $R_L = 2 k\Omega$ | 25°C | | 120 | | | 120 | | dB |
| | Chart sive it autout auront | V 0 | $V_{ID} = 1 V$ | 0500 | -30 | -45 | | -30 | -45 | | A |
| los | Short-circuit output current | $V_O = 0$ | $V_{ID} = -1 V$ | 25°C | 30 | 48 | | 30 | 48 | | mA |

TLE2072I operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15~V$

| | | | | | | TLE2072I | | Т | LE2072A | | |
|--------------------|--------------------------------------|---|--|------------------|-----|----------|-----|-----|---------|-----|--------------------|
| 1 | PARAMETER | TEST CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | | | | 25°C | 28 | 40 | | 28 | 40 | | |
| SR+ | Positive slew rate | V _{O(PP)} = ±10 V | | Full range | 22 | | | 22 | | | V/μs |
| | | $A_{VD} = -1$, $C_{L} = 100 \text{ pF}$, | $R_L = 2 k\Omega$, See Figure 1 | 25°C | 30 | 45 | | 30 | 45 | | |
| SR- | Negative slew rate | | , and the second | Full range | 22 | | | 22 | | | V/μs |
| | Cattling time | $A_{VD} = -1,$ 10-V step, | To 10 mV | 0E°C | | 0.4 | | | 0.4 | | |
| t _s | Settling time | $R_L = 1 k\Omega$, $C_L = 100 pF$ | To 1 mV | 25°C | | 1.5 | | | 1.5 | | μs |
| V | Equivalent input | $R_S = 20 \Omega$, f See Figure 3 | f = 10 Hz | 05°C | | 48 | 85 | | 48 | 85 | nV/√ Hz |
| V _n | noise voltage | | f = 10 kHz | 25°C | | 12 | 17 | | 12 | 17 | IIV/∀⊓Z |
| | Peak-to-peak | | f = 0 Hz to 10 kHz | 0500 | | 6 | | | 6 | | ., |
| V _{N(PP)} | equivalent input noise voltage | | f = 0.1 Hz to 10 Hz | 25°C | | 0.6 | | | 0.6 | | μV |
| In | 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 | $V_{O(PP)} = 20 \text{ V},$ f = 1 kHz, $R_S = 25 \Omega$ | $A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$ | 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 | $V_{O(PP)} = 20 \text{ V},$ $R_L = 2 \text{ k}\Omega,$ | $A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$ | 25°C | 478 | 637 | | 478 | 637 | | kHz |
| φ _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 -40°C to 85°C.

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TLE2072M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted)

| | DADAMETED | TEST OO | NDITIONS | | TL | E2072N | 1 | TL | E2072A | М | LINUT |
|-----------------------|---|--|----------------------------|------------------|-----------------|------------------|------|-----------------|------------------|-----|-------|
| | PARAMETER | IESI CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| V | Input offset voltage | | | 25°C | | 0.9 | 6 | | 0.65 | 3.5 | mV |
| V_{IO} | Input offset voltage | | $V_{O} = 0$, | Full range | | | 10.5 | | | 8 | mv |
| α_{VIO} | Temperature coefficient of input offset voltage | $R_S = 50 \Omega$, | | Full range | | 2.3 | 25* | | 2.3 | 25* | μV/°C |
| | Innut offeet europt | | | 25°C | | 5 | 100 | | 5 | 100 | pА |
| I _{IO} | Input offset current | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 20 | | | 20 | nA |
| 1 | Input bias current | See Figure 4 | | 25°C | | 15 | 175 | | 15 | 175 | pА |
| I _{IB} | input bias current | | | Full range | | | 60 | | | 60 | nA |
| V: | Common-mode input | R _S = 50 Ω | | 25°C | 5 to –1 | 5 to –1.9 | | 5 to –1 | 5 to –1.9 | | ٧ |
| V _{ICR} | voltage range | ng = 30 sz | | Full range | 5 to -0.8 | | | 5 to -0.8 | | | V |
| | | I _O = -200 μA | | 25°C | 3.8 | 4.1 | | 3.8 | 4.1 | | |
| | | 10 = -200 μΑ | | Full range | 3.6 | | | 3.6 | | | |
| V | Maximum positive peak | $I_{O} = -2 \text{ mA}$ | | 25°C | 3.5 | 3.9 | | 3.5 | 3.9 | | ٧ |
| V _{OM+} | output voltage swing | 10 = -2 IIIA | | Full range | 3.3 | | | 3.3 | | | V |
| | | In - 20 mA | | 25°C | 1.5 | 2.3 | | 1.5 | 2.3 | | |
| | | $I_0 = -20 \text{ mA}$ | | Full range | 1.4 | | | 1.4 | | | |
| | | I _O = 200 μA | | 25°C | -3.8 | -4.2 | | -3.8 | -4.2 | | |
| | | 10 = 200 μΑ | | Full range | -3.6 | | | -3.6 | | | |
| | Maximum negative peak | I _O = 2 mA | | 25°C | -3.5 | -4.1 | | -3.5 | -4.1 | | V |
| V _{OM} - | output voltage swing | 10 = 2 IIIA | | Full range | -3.3 | | | -3.3 | | | V |
| | | 1 20 mA | | 25°C | -1.5 | -2.4 | | -1.5 | -2.4 | | |
| | | I _O = 20 mA | | Full range | -1.4 | | | -1.4 | | | |
| | | | $R_L = 600 \Omega$ | 25°C | 80 | 91 | | 80 | 91 | | |
| | | | n[= 000 sz | Full range | 78 | | | 78 | | | |
| Δ | Large-signal differential | $V_{O} = \pm 2.3 \text{ V}$ | $R_L = 2 k\Omega$ | 25°C | 90 | 100 | | 90 | 100 | | dB |
| A_{VD} | voltage amplification | VO = 12.5 V | 11L - 2 K32 | Full range | 88 | | | 88 | | | uБ |
| | | | $R_L = 10 \text{ k}\Omega$ | 25°C | 95 | 106 | | 95 | 106 | | |
| | | | H_ = 10 K22 | Full range | 93 | | | 93 | | | |
| rį | Input resistance | $V_{IC} = 0$ | | 25°C | | 10 ¹² | | | 10 ¹² | | Ω |
| Ci | Input capacitance | V _{IC} = 0, See Figure 5 | Common mode | 25°C | | 11 | | | 11 | | pF |
| | | Jee i iguie 5 | Differential | 25°C | | 2.5 | | | 2.5 | | |
| z _o | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMDD | Common-mode | V _{IC} = V _{ICR} min | 1, | 25°C | 70 | 89 | | 70 | 89 | | 40 |
| CMRR | rejection ratio | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 68 | | | 68 | | | dB |

^{*}On products compliant to MIL-PRF-38535, Class B, this parameter is not production tested.



[†] Full range is –55°C to 125°C.

TLE2072M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted) (continued)

| | DADAMETED | TECT OF | NDITIONS | | TL | .E2072N | Λ | TL | E2072A | М | LINUT |
|------------------|---|--|--|------------------|-----|---------|-----|-----|--------|-----|-------|
| | PARAMETER | TEST CO | INDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| k _{SVR} | Supply-voltage rejection ratio ($\Delta V_{CC\pm}$ / ΔV_{IO}) | $V_{CC\pm} = \pm 5 V$ $V_{O} = 0$, | to \pm 15 V, R _S = 50 Ω | Full range | 80 | | | 80 | | | dB |
| | Supply current | ., . | No local | 25°C | 2.7 | 2.9 | 3.6 | 2.7 | 2.9 | 3.6 | |
| ICC | (both channels) | $V_{O} = 0$, | No load | Full range | | | 3.6 | | | 3.6 | mA |
| a _x | Crosstalk attenuation | $V_{IC} = 0$, | $R_L = 2 k\Omega$ | 25°C | | 120 | | | 120 | | dB |
| | Short-circuit output | V 0 | $V_{ID} = 1 V$ | 0500 | | -35 | | | -35 | | A |
| los | current | $V_O = 0$ | $V_{ID} = -1 V$ | 25°C | | 45 | | | 45 | | mA |

[†] Full range is -55°C to 125°C.

TLE2072M operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 5~V$

| | | | | | Т | LE2072N | 1 | TI | _E2072AN | Л | |
|--------------------|--------------------------------------|--|--|------------------|-----|---------|-----|-----|----------|-----|--------------------|
| | PARAMETER | TEST CON | IDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | | | | 25°C | | 35 | | | 35 | | |
| SR+ | Positive slew rate | $V_{O(PP)} = \pm 2.3 \text{ V}$ | /, D | Full range | 18* | | | 18* | | | V/μs |
| | | $A_{VD} = -1$, $C_{I} = 100 \text{ pF}$, | - | 25°C | | 38 | | | 38 | | |
| SR- | Negative slew rate | | J | Full range | 18* | | | 18* | | | V/μs |
| | Settling time | $A_{VD} = -1,$ 2-V step, | To 10 mV | 25°C | | 0.25 | | | 0.25 | | |
| t _s | Settling time | $R_L = 1 \text{ k}\Omega,$ $C_L = 100 \text{ pF}$ | To 1 mV | 25°C | | 0.4 | | | 0.4 | | μs |
| ., | Equivalent input noise | | f = 10 Hz | 25°C | | 48 | 85* | | 48 | 85* | nV/√ Hz |
| V _n | voltage | f = | f = 10 kHz | 25°C | | 12 | 17* | | 12 | 17* | IIV/VIIZ |
| ., | Peak-to-peak | $R_S = 20 \Omega$, See Figure 3 | f = 10 Hz to 10 kHz | 2502 | | 6 | | | 6 | | ., |
| V _{N(PP)} | equivalent input noise voltage | | f = 0.1 Hz to 10 Hz | 25°C | | 0.6 | | | 0.6 | | μV |
| In | 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 | $V_{O(PP)} = 5 \text{ V},$ f = 1 kHz, $R_S = 25 \Omega$ | $A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$ | 25°C | | 0.013% | | | 0.013% | | |
| B ₁ | Unity-gain bandwidth | $V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | | 9.4 | | | 9.4 | | MHz |
| B _{OM} | Maximum output-swing bandwidth | $V_{O(PP)} = 4 \text{ V},$ $R_L = 2 \text{ k}\Omega$, | $A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$ | 25°C | | 2.8 | | | 2.8 | | MHz |
| φ _m | Phase margin at unity gain | $V_{I} = 10 \text{ mV},$ $C_{L} = 25 \text{ pF},$ | $R_L = 2 kΩ$, See Figure 2 | 25°C | | 56° | | | 56° | | |

^{*}On products compliant to MIL-PRF-38535, Class B, this parameter is not production tested.



[†] Full range is –55°C to 125°C.

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TLE2072M electrical characteristics at specified free-air temperature, V_{CC^\pm} = ± 15 V (unless otherwise noted)

| | DADAMETED | | NEUTIONO | | T | LE2072N | Л | TL | E2072A | M | |
|------------------------|---|--|----------------------------|------------------|-------------------|-------------------|------|-------------------|-------------------|-----|-------|
| | PARAMETER | TEST CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| V _{IO} | Input offset voltage | | | 25°C | | 1.1 | 6 | | 0.7 | 3.5 | mV |
| VIO | input onset voltage | | $V_{O} = 0$, | Full range | | | 10.5 | | | 8 | IIIV |
| $\alpha_{	extsf{VIO}}$ | Temperature coefficient of input offset voltage | $R_S = 50 \Omega$ | | Full range | | 2.4 | 25* | | 2.4 | 25* | μV/°C |
| 1 | Input offset ourrent | | | 25°C | | 6 | 100 | | 6 | 100 | pА |
| I _{IO} | Input offset current | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 20 | | | 20 | nA |
| L. | Input bias current | See Figure 4 | | 25°C | | 20 | 175 | | 20 | 175 | pА |
| I _{IB} | input bias current | | | Full range | | | 60 | | | 60 | nA |
| V | Common-mode input | R _S = 50 Ω | | 25°C | 15 to –11 | 15 to –11.9 | | 15 to –11 | 15 to –11.9 | | V |
| V _{ICR} | voltage range | ng = 50 12 | | Full range | 15 to –10.8 | | | 15 to -10.8 | | | V |
| | | $I_{O} = -200 \mu\text{A}$ | | 25°C | 13.8 | 14.1 | | 13.8 | 14.1 | | |
| | | 10 = -200 μΑ | | Full range | 13.6 | | | 13.6 | | | |
| V | Maximum positive peak | $I_O = -2 \text{ mA}$ | | 25°C | 13.5 | 13.9 | | 13.5 | 13.9 | | V |
| V _{OM+} | output voltage swing | 10 = -2 IIIA | | Full range | 13.3 | | | 13.3 | | | V |
| | | $I_{O} = -20 \text{ mA}$ | | 25°C | 11.5 | 12.3 | | 11.5 | 12.3 | | |
| | | 10 = -20 IIIA | | Full range | 11.4 | | | 11.4 | | | |
| | | I _O = 200 μA | | 25°C | -13.8 | -14.2 | | -13.8 | -14.2 | | |
| | | I _O = 200 μA | | Full range | -13.6 | | | -13.6 | | | |
| v | Maximum negative peak | | | 25°C | -13.5 | -14 | | -13.5 | -14 | | ., |
| V_{OM-} | output voltage swing | $I_O = 2 \text{ mA}$ | | Full range | -13.3 | | | -13.3 | | | V |
| | | | | 25°C | -11.5 | -12.4 | | -11.5 | -12.4 | | |
| | | $I_O = 20 \text{ mA}$ | | Full range | -11.4 | | | -11.4 | | | |
| | | | D 000 0 | 25°C | 80 | 96 | | 80 | 96 | | |
| | | | $R_L = 600 \Omega$ | Full range | 78 | | | 78 | | | |
| | Large-signal differential | V 140.V | D 01:0 | 25°C | 90 | 109 | | 90 | 109 | | -ID |
| A_{VD} | voltage amplification | $V_O = \pm 10 \text{ V}$ | $R_L = 2 k\Omega$ | Full range | 89 | | | 89 | | | dB |
| | | | D 401-0 | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | $R_L = 10 \text{ k}\Omega$ | Full range | 93 | | | 93 | | | |
| rį | Input resistance | V _{IC} = 0 | | 25°C | | 10 ¹² | | | 10 ¹² | | Ω |
| Ci | Input capacitance | V _{IC} = 0, See Figure 5 | Common mode | 25°C | | 7.5 | | | 7.5 | | pF |
| | | See Figure 5 | Differential | 25°C | | 2.5 | | | 2.5 | | |
| z _o | Open-loop output impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMEE | Common-mode | V _{IC} = V _{ICR} mir | n, | 25°C | 80 | 98 | | 80 | 98 | | 10 |
| CMRR | rejection ratio | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 78 | | | 78 | | | dB |
| | Supply-voltage rejection | V _{CC±} = ±5 V t | to ±15 V, | 25°C | 82 | 99 | | 82 | 99 | | į |
| k _{SVR} | ratio $(\Delta V_{CC\pm}/\Delta V_{IO})$ | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 80 | | | 80 | | | dB |

^{*}On products compliant to MIL-PRF-38535, Class B, this parameter is not production tested.



[†] Full range is –55°C to 125°C.

TLE2072M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 15 V (unless otherwise noted)

| | DADAMETED | TEST CONDITIONS T. † | | T.1 | | TLI | E2072A | М | | | |
|----------------|-----------------------|----------------------|-------------------|------------------|-----|-----|--------|-----|-----|-----|------|
| | PARAMETER | IESI CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | Supply current | V 0 | Nalaad | 25°C | 2.7 | 3.1 | 3.6 | 2.7 | 3.1 | 3.6 | А |
| ICC | (both channels) | $V_{O} = 0$, | No load | Full range | | | 3.6 | | | 3.6 | mA |
| a _x | Crosstalk attenuation | $V_{IC} = 0$, | $R_L = 2 k\Omega$ | 25°C | | 120 | | | 120 | | dB |
| | Short-circuit output | V 0 | $V_{ID} = 1 V$ | 0500 | -30 | -45 | | -30 | -45 | | А |
| los | current | $V_O = 0$ | $V_{ID} = -1 V$ | 25°C | 30 | 48 | | 30 | 48 | | mA |

[†] Full range is -55°C to 125°C.

TLE2072M operating characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 15~\text{V}$

| | | | | _ | Т | LE2072M | | T | LE2072AN | Л | |
|--------------------|--------------------------------------|---|--|------------------|------|---------|-----|------|----------|-----|--------------------|
| | PARAMETER | TEST CON | IDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | | | | 25°C | 28 | 40 | | 28 | 40 | | |
| SR+ | Positive slew rate | $V_{O(PP)} = 10 \text{ V},$ | | Full range | 20 | | | 20 | | | V/μs |
| | | $R_L = 2 k\Omega$, See Figure 1 | $C_L = 100 pF,$ | 25°C | 30 | 45 | | 30 | 45 | | |
| SR- | Negative slew rate | 3 | | Full range | 20 | | | 20 | | | V/μs |
| | Settling time | $A_{VD} = -1,$ 10-V step, | To 10 mV | 25°C | | 0.4 | | | 0.4 | | |
| t _s | Settling time | $R_L = 1 k\Omega$, $C_L = 100 pF$ | To 1 mV | 25°C | | 1.5 | | | 1.5 | | μs |
| V_n | Equivalent input noise | | f = 10 Hz | 25°C | | 48 | 85* | | 48 | 85* | nV/√ Hz |
| v _n | voltage | L | f = 10 kHz | 25 C | | 12 | 17* | | 12 | 17* | 110/ 1112 |
| \ \ ' | Peak-to-peak | $R_S = 20 \Omega$, See Figure 3 | f = 10 Hz to 10 kHz | 0500 | | 6 | | | 6 | | |
| V _{N(PP)} | equivalent input noise voltage | | f = 0.1 Hz to 10 Hz | 25°C | | 0.6 | | | 0.6 | | μV |
| In | 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 | $V_{O(PP)} = 20 \text{ V},$ f = 1 kHz, $R_S = 25 \Omega$ | $A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$ | 25°C | | 0.008% | | | 0.008% | | |
| B ₁ | Unity-gain bandwidth | $V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | 8* | 10 | | 8* | 10 | | MHz |
| B _{OM} | Maximum output-swing bandwidth | $V_{O(PP)} = 20 \text{ V},$ $R_L = 2 \text{ k}\Omega,$ | $A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$ | 25°C | 478* | 637 | | 478* | 637 | | kHz |
| фm | Phase margin at unity gain | $V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | | 57° | | | 57° | | |

^{*}On products compliant to MIL-PRF-38535, Class B, this parameter is not production tested.



[†] Full range is -55°C to 125°C.

TLE207x, TLE207xA EXCALIBUR LOW-NOISE HIGH-SPEED JFET-INPUT OPERATIONAL AMPLIFIERS SLOS181C - FEBRUARY 1997 - REVISED DECEMBER 2009

TLE2072Y electrical characteristics at $V_{CC\pm}$ = ± 15 V, T_A = $25^{\circ}C$

| | DADAMETED | | CONDITIO | NO. | Т | LE2072\ | 1 | |
|------------------|---|--|------------------------|---------------------|-----------------|------------------|-----|------|
| | PARAMETER | lesi | CONDITIO | NS | MIN | TYP | 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 | | | 0 =: 1 | | 6 | 100 | pА |
| I _{IB} | Input bias current | $V_{IC} = 0,$ | $V_{O} = 0$, | See Figure 4 | | 20 | 175 | pА |
| V _{ICR} | Common-mode input voltage range | $R_S = 50 \Omega$ | | | 15 to –11 | 15 to 11.9 | | ٧ |
| | | $I_O = -200 \mu\text{A}$ | | | 13.8 | 14.1 | | |
| V _{OM+} | Maximum positive peak output voltage swing | $I_O = -2 \text{ mA}$ | | | 13.5 | 13.9 | | V |
| | | $I_O = -20 \text{ mA}$ | | | 11.5 | 12.3 | | |
| | | $I_O = 200 \mu A$ | | | -13.8 | -14.2 | | |
| V_{OM-} | Maximum negative peak output voltage swing | $I_O = 2 \text{ mA}$ | | | -13.5 | -14 | | V |
| | ou.put rottage offittig | $I_O = 20 \text{ mA}$ | | -11.5 | -12.4 | | | |
| | | | $R_{L} = 600$ | Ω | 80 | 96 | | |
| A_{VD} | Large-signal differential voltage amplification | $V_O = \pm 10 \text{ V}$ | $R_L = 2 k\Omega$ | Ω | 90 | 109 | | dB |
| | | | $R_{L} = 10 \text{k}$ | Ω | 95 | 118 | | |
| r _i | Input resistance | $V_{IC} = 0$ | | | | 10 ¹² | | Ω |
| | | $V_{IC} = 0$, | Common | n mode | | 7.5 | | |
| c _i | Input capacitance | See Figure 5 | Differenti | al | | 2.5 | | рF |
| z _o | Open-loop output impedance | f = 1 MHz | | | | 80 | | Ω |
| CMRR | Common-mode rejection ratio | $V_{IC} = V_{ICR}min,$ | $V_O = 0$, | $R_S = 50 \Omega$ | 80 | 98 | | dB |
| k _{SVR} | Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC\pm} = \pm 5 \text{ V to } \pm 1$ $R_S = 50 \Omega$ | 5 V, | V _O = 0, | 82 | 99 | | dB |
| I _{CC} | Supply current (both channels) | $V_O = 0$, | No load | | 2.7 | 3.1 | 3.9 | mA |
| | Chart size it autout august | \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ | V _{ID} = 1 V | 1 | -30 | -45 | | ^ |
| los | Short-circuit output current | $V_{O} = 0$ $V_{ID} = -1 \text{ V}$ | | V | 30 | 48 | | mA |



TLE2074C electrical characteristics at specified free-air temperature, V_{CC^\pm} = ± 5 V (unless otherwise noted)

| | DA DAME: | | TF0T 00 | NDITIONO | -+ | TL | E2074 | C | TL | E2074A | C | |
|-----------------------|-----------------------------|---------------------|--|------------------------|------------------|-----------------|------------------|------|-----------------|------------------|------|-------|
| | PARAME | IER | TEST CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| V | Innut offeet w | oltogo | | | 25°C | | -1.6 | 5 | | -0.5 | 3 | m\/ |
| V_{IO} | Input offset vo | oltage | | $V_{O} = 0$, | Full range | | | 7.1 | | | 5.1 | mV |
| α_{VIO} | Temperature of input offset | | $R_S = 50 \Omega$ | | Full range | | 10.1 | 30 | | 10.1 | 30 | μV/°C |
| | | | | | 25°C | | 15 | 100 | | 15 | 100 | 4 |
| I _{IO} | Input offset cu | urrent | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 1400 | | | 1400 | pA |
| | lanced bing according | | See Figure 4 | | 25°C | | 20 | 175 | | 20 | 175 | ^ |
| I _{IB} | Input bias cur | rent | | | Full range | | | 5000 | | | 5000 | рA |
| ., | Common-mod | de input | D 50 0 | | 25°C | 5 to -1 | 5 to -1.9 | | 5 to -1 | 5 to -1.9 | | V |
| V _{ICR} | voltage range | • | $R_S = 50 \Omega$ | | Full range | 5 to -0.9 | | | 5 to -0.9 | | | ٧ |
| | | | J 000 A | | 25°C | 3.8 | 4.1 | | 3.8 | 4.1 | | |
| | | | $I_{O} = -200 \mu\text{A}$ | | Full range | 3.7 | | | 3.7 | | | |
| \ <i>\</i> | Maximum pos | sitive peak | 1 0 m 1 | | 25°C | 3.5 | 3.9 | | 3.5 | 3.9 | | V |
| V _{OM+} | output voltage | e swing | $I_0 = -2 \text{ mA}$ | | Full range | 3.4 | | | 3.4 | | | V |
| | | | 1 00 m A | | 25°C | 1.5 | 2.3 | | 1.5 | 2.3 | | |
| | | | $I_0 = -20 \text{ mA}$ | | Full range | 1.5 | | | 1.5 | | | |
| | | | I _O = 200 μA | | 25°C | -3.8 | -4.2 | | -3.8 | -4.2 | | |
| | | | 10 = 200 μΑ | | Full range | -3.7 | | | -3.7 | | | |
| V | Maximum neg | | I _O = 2 mA | | 25°C | -3.5 | -4.1 | | -3.5 | -4.1 | | V |
| V_{OM-} | output voltage | e swing | 10 = 2 IIIA | | Full range | -3.4 | | | -3.4 | | | V |
| | | | I _O = 20 mA | | 25°C | -1.5 | -2.4 | | -1.5 | -2.4 | | |
| | | | 10 = 20 IIIA | _ | Full range | -1.5 | | | -1.5 | | | |
| | | | | $R_L = 600 \Omega$ | 25°C | 80 | 91 | | 80 | 91 | | |
| | | | | 11[= 000 32 | Full range | 79 | | | 79 | | | |
| A_{VD} | Large-signal | | $V_{O} = \pm 2.3 \text{ V}$ | $R_L = 2 k\Omega$ | 25°C | 90 | 100 | | 90 | 100 | | dB |
| , vD | voltage ampli | fication | VO = ±2.0 V | 11[- 2 1(32 | Full range | 89 | | | 89 | | | ub. |
| | | | | R _L = 10 kΩ | 25°C | 95 | 106 | | 95 | 106 | | |
| | | | | 11[= 10 1/32 | Full range | 94 | | | 94 | | | |
| rį | Input resistan | ce | $V_{IC} = 0$ | | 25°C | | 10 ¹² | | | 10 ¹² | | Ω |
| 0. | Input | Common mode | V 0 | See Figure 5 | 25°C | | 11 | | | 11 | | pF |
| Ci | capacitance | Differential | $V_{IC} = 0,$ | See Figure 5 | 25°C | | 2.5 | | | 2.5 | | þΓ |
| Z _O | Open-loop ou | tput impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMRR | Common mor | de rejection ratio | V _{IC} = V _{ICR} mir | | 25°C | 70 | 89 | | 70 | 89 | | dB |
| CIVIRK | COMMINION-MOR | ue rejection ratio | $V_{O} = 0,$ | $R_S = 50 \Omega$ | Full range | 68 | | | 68 | | | uD |
| kov- | Supply-voltag | • | $V_{CC\pm} = \pm 5 \text{ V}$ | | 25°C | 82 | 99 | | 82 | 99 | | dB |
| k _{SVR} | ratio (∆V _{CC±} / | ′ΔV _{IO}) | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 80 | | | 80 | | | ub |

[†] Full range is 0°C to 70°C.



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TLE2074C electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted) (continued)

| | DADAMETED | TEOT 00 | NDITIONO | T _A † | | | TL | E2074A | С | | | | |
|-----|-----------------------|---------------------------|-------------------|------------------|-----|------|-----|--------|-----|-----|------|--|----|
| | PARAMETER | TEST CO | NDITIONS | IAI | MIN | TYP | MAX | MIN | TYP | MAX | UNIT | | |
| | Supply current | V 0 | No local | 25°C | 5.2 | 6.3 | 7.5 | 5.2 | 6.3 | 7.5 | A | | |
| ICC | (four amplifiers) | $V_{O} = 0$, | No load | Full range | | | 7.5 | | | 7.5 | mA | | |
| | Crosstalk attenuation | $V_{IC} = 0$, | $R_L = 2 k\Omega$ | 25°C | | 120 | | | 120 | | dB | | |
| | Short-circuit output | V 0 | $V_{ID} = 1 V$ | 0500 | | -35 | | | -35 | | A | | |
| IOS | current | $V_O = 0$ $V_{ID} = -1 V$ | · Vo = () | · 1/0 = 0 | | 25°C | | 45 | | | 45 | | mA |

[†] Full range is 0°C to 70°C.

TLE2074C operating characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 5~\text{V}$

| | | | | | TL | E20740 | | TL | E2074A | С | |
|--------------------|--------------------------------------|--|---|------------------|-----|--------|-----|-----|--------|-----|--------------------|
| | PARAMETER | TEST CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | | | | 25°C | | 35 | | | 35 | | |
| SR+ | Positive slew rate | V _{O(PP)} = ±2.3 \ | | Full range | 22 | | | 22 | | | V/μs |
| | | $A_{VD} = -1,$ $C_{L} = 100 \text{ pF},$ | $H_L = 2 \text{ K}\Omega$, See Figure 1 | 25°C | | 38 | | | 38 | | |
| SR- | Negative slew rate | ,, | | Full range | 22 | | | 22 | | | V/μs |
| + | Settling time | $A_{VD} = -1,$ 2-V step, | To 10 mV | 25°C | | 0.25 | | | 0.25 | | |
| t _s | Settling time | $R_L = 1 \text{ k}\Omega,$ $C_L = 100 \text{ pF}$ | To 1 mV | 25 0 | | 0.4 | | | 0.4 | | μS |
| V | Equivalent input noise | | f = 10 Hz | 25°C | | 48 | 85 | | 48 | 85 | nV/√ Hz |
| V _n | voltage | | f = 10 kHz | 25 C | | 12 | 17 | | 12 | 17 | 110/ 1112 |
| V | Peak-to-peak equivalent | $R_S = 20 \Omega$, See Figure 3 | f = 10 Hz to 10 kHz | - 25°C | | 6 | | | 6 | | μV |
| V _{N(PP)} | input noise voltage | | f = 0.1Hz to 10 Hz | 25 0 | | 0.6 | | | 0.6 | | μν |
| In | 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 | $V_{O(PP)} = 5 \text{ V},$ f = 1 kHz, $R_S = 25 \Omega$ | $A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$ | 25°C | 0 | .013% | | O | 0.013% | | |
| B ₁ | Unity-gain bandwidth | $V_{I} = 10 \text{ mV},$ $C_{L} = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | | 9.4 | | | 9.4 | | MHz |
| B _{OM} | Maximum output-swing bandwidth | $V_{O(PP)} = 4 \text{ V},$ $R_L = 2 \text{ k}\Omega$, | $A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$ | 25°C | | 2.8 | | | 2.8 | | MHz |
| φ _m | Phase margin at unity gain | $V_{I} = 10 \text{ mV},$ $C_{L} = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | | 56° | | | 56° | | |

[†] Full range is 0°C to 70°C.



TLE2074C electrical characteristics at specified free-air temperature, V_{CC^\pm} = ± 15 V (unless otherwise noted)

| | DADAMETED | | TECT OO | NDITIONS | T + | T | LE20740 |) | TL | E2074A | C | LINUT |
|-----------------------|---------------------------------------|---------------|--|----------------------------|------------------|-------------------|-------------------|------|-------------------|-------------------|------|-------|
| | PARAMETER | | TEST CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| V | Innut offeet veltee | | | | 25°C | | -1.6 | 5 | | -0.5 | 3 | m\/ |
| V_{IO} | Input offset voltag | je | | $V_{O} = 0$, | Full range | | | 7.1 | | | 5.1 | mV |
| α_{VIO} | Temperature coef of input offset volt | | $R_S = 50 \Omega$ | | Full range | | 10.1 | 30 | | 10.1 | 30 | μV/°C |
| | land the ffeet and a | | | | 25°C | | 15 | 100 | | 15 | 100 | 4 |
| I _{IO} | Input offset currer | π | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 1400 | | | 1400 | pΑ |
| | land this a summer | | See Figure 4 | | 25°C | | 25 | 175 | | 25 | 175 | A |
| I _{IB} | Input bias current | | | | Full range | | | 5000 | | | 5000 | рA |
| | Common-mode ir | nput | | | 25°C | 15 to –11 | 15 to -11.9 | | 15 to –11 | 15 to -11.9 | | |
| V _{ICR} | voltage range | • | $R_S = 50 \Omega$ | | Full range | 15 to –10.9 | | | 15 to -10.9 | | | V |
| | | | | | 25°C | 13.8 | 14.1 | | 13.8 | 14.1 | | |
| | | | $I_{O} = -200 \mu\text{A}$ | | Full range | 13.7 | | | 13.7 | | | |
| | Maximum positive | e peak | | | 25°C | 13.5 | 13.9 | | 13.5 | 13.9 | | |
| V_{OM+} | output voltage sw | | $I_0 = -2 \text{ mA}$ | | Full range | 13.4 | | | 13.4 | | | V |
| | | | | | 25°C | 11.5 | 12.3 | | 11.5 | 12.3 | | |
| | | | $I_O = -20 \text{ mA}$ | | Full range | 11.5 | | | 11.5 | | | |
| | | | | | 25°C | -13.8 | -14.2 | | -13.8 | -14.2 | | |
| | | | $I_{O} = 200 \mu\text{A}$ | | Full range | -13.7 | | | -13.7 | | | |
| | Maximum negativ | e peak | | | 25°C | -13.7 | -14 | | -13.7 | -14 | | |
| V_{OM-} | output voltage sw | | $I_O = 2 \text{ mA}$ | | Full range | -13.6 | | | -13.6 | | | V |
| | | | | | 25°C | -11.5 | -12.4 | | -11.5 | -12.4 | | |
| | | | $I_O = 20 \text{ mA}$ | | Full range | -11.5 | | | -11.5 | | | |
| | | | | | 25°C | 80 | 96 | | 80 | 96 | | |
| | | | | $R_L = 600 \Omega$ | Full range | 79 | | | 79 | | | |
| | Large-signal diffe | rential | | | 25°C | 90 | 109 | | 90 | 109 | | |
| A_{VD} | voltage amplificat | | $V_0 = \pm 10 \text{ V}$ | $R_L = 2 k\Omega$ | Full range | 89 | | | 89 | | | dB |
| | | | | | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | | $R_L = 10 \text{ k}\Omega$ | 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 |
| | сараснансе | Differential | | | 25°C | | 2.5 | | | 2.5 | | |
| Z _O | Open-loop output | impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| | Common-mode | | V _{IC} = V _{ICR} mir | ١, | 25°C | 80 | 98 | | 80 | 98 | | |
| CMRR | rejection ratio | | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 79 | | | 79 | | | dB |
| | Supply-voltage re | jection ratio | $V_{CC\pm} = \pm 5 \text{ V}$ | to ± 15 V, | 25°C | 82 | 99 | | 82 | 99 | | |
| k _{SVR} | $(\Delta V_{CC\pm}/\Delta V_{IO})$ | - | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 81 | | | 81 | | | dB |

[†] Full range is 0°C to 70°C.



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TLE2074C electrical characteristics at specified free-air temperature, V_{CC^\pm} = ± 15 V (unless otherwise noted) (continued)

| PARAMETER | | TEST CONDITIONS | | T _A † | TLE2074C | | | TLE2074AC | | | |
|-----------------|----------------------------------|---------------------|-------------------|------------------|----------|-----|-----|-----------|-----|-----|------|
| | | | | | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| 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 | |
| | 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 0°C to 70°C.

TLE2074C operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15~V$

| | DADAMETED | | | | TLE2074C | | | TLE2074AC | | | | |
|-----------------|---|---|--|------------------|----------|-----|--------|-----------|-----|-----|--------------------|--|
| PARAMETER | | TEST CONDITIONS | | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT | |
| | 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 | | | |
| SR+ | | | | Full range | 22 | | | 22 | | | V/μs | |
| | | | | 25°C | 30 | 45 | | 30 | 45 | | V/μs | |
| SR- | Negative slew rate | | | Full range | 25 | | | 25 | | | | |
| t _s | Settling time | $A_{VD} = -1,$ 10-V step, | To 10 mV | 25°C | | 0.4 | | | 0.4 | | με | |
| | | $R_L = 1 k\Omega$, $C_L = 100 pF$ | To 1 mV | | | 1.5 | | | 1.5 | | | |
| V | Equivalent input noise voltage | $R_S = 20 \Omega$, See Figure 3 | f = 10 Hz | 25°C | | 48 | 85 | | 48 | 85 | nV/√ Hz | |
| V_n | | | f = 10 kHz | | | 12 | 17 | | 12 | 17 | | |
| V | Peak-to-peak equivalent input noise voltage | | f = 10 Hz to 10 kHz | - 25°C | | 6 | | | 6 | | μV | |
| $V_{N(PP)}$ | | | f = 0.1 Hz to 10 Hz | | | 0.6 | | | 0.6 | | μν | |
| In | 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 | $V_{O(PP)} = 20 \text{ V},$ f = 1 kHz, $R_S = 25 \Omega$ | $A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$ | 25°C | 0.008% | | 0.008% | | | | | |
| B ₁ | Unity-gain bandwidth | $V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | 8 | 10 | | 8 | 10 | | MHz | |
| B _{OM} | Maximum output-swing bandwidth | $V_{O(PP)} = 20 \text{ V},$ $R_L = 2 \text{ k}\Omega,$ | $A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$ | 25°C | 478 | 637 | | 478 | 637 | | kHz | |
| φ _m | Phase margin at unity gain | V _I = 10 mV, C _L = 25 pF, | $R_L = 2 \text{ k}\Omega$, See Figure 2 | 25°C | _ | 57° | _ | _ | 57° | _ | | |

[†] Full range is 0°C to 70°C.



TLE2074I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted)

| | DADAME | ren. | TEST OO | NDITIONS | T + | Т | LE2074 | I | TL | E2074 | AI . | LINUT |
|-----------------------|--|-----------------------|-------------------------------|----------------------------|------------------|-----------------|------------------|-----|-----------------|------------------|------|-------|
| | PARAMET | IEK | TEST CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| V | Innut offeet us | ltogo | | | 25°C | | -1.6 | 5 | | -0.5 | 3 | m\/ |
| V_{IO} | Input offset vo | itage | | $V_{O} = 0$, | Full range | | | 9 | | | 7 | mV |
| α_{VIO} | Temperature of input offset | | $R_S = 50 \Omega$ | | Full range | | 10.1 | 30 | | 10.1 | 30 | μV/°C |
| | Innut offeet ou | wo mt | | | 25°C | | 15 | 100 | | 15 | 100 | pА |
| I _{IO} | Input offset cu | rrent | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 5 | | | 5 | nA |
| 1 | Innut biog our | ont | See Figure 4 | | 25°C | | 20 | 175 | | 20 | 175 | pА |
| I _{IB} | Input bias curr | ent | | | Full range | | | 10 | | | 10 | nA |
| v | Common-mod | e input | B 50.0 | | 25°C | 5 to -1 | 5 to -1.9 | | 5 to -1 | 5 to -1.9 | | V |
| V _{ICR} | voltage range | | $R_S = 50 \Omega$ | | Full range | 5 to -0.8 | | | 5 to -0.8 | | | V |
| | | | | | 25°C | 3.8 | 4.1 | | 3.8 | 4.1 | | |
| | | | $I_{O} = -200 \mu\text{A}$ | | Full range | 3.7 | | | 3.7 | | | |
| V | Maximum positive peak output voltage swing | la = 2 mA | | 25°C | 3.5 | 3.9 | | 3.5 | 3.9 | | V | |
| V _{OM+} | output voltage | swing | $I_0 = -2 \text{ mA}$ | | Full range | 3.4 | | | 3.4 | | | V |
| | | | $I_{O} = -20 \text{ mA}$ | | 25°C | 1.5 | 2.3 | | 1.5 | 2.3 | | |
| | | | 10 = -20 IIIA | | Full range | 1.5 | | | 1.5 | | | |
| | | | I _O = 200 μA | | 25°C | -3.8 | -4.2 | | -3.8 | -4.2 | | |
| | | | 10 = 200 μΑ | | Full range | -3.7 | | | -3.7 | | | |
| V_{OM-} | Maximum neg | | I _O = 2 mA | | 25°C | -3.5 | -4.1 | | -3.5 | -4.1 | | ٧ |
| VOM – | output voltage | swing | 10 – 2 1117 | | Full range | -3.4 | | | -3.4 | | | V |
| | | | I _O = 20 mA | | 25°C | -1.5 | -2.4 | | -1.5 | -2.4 | | |
| | | | 10 - 20 111/1 | 1 | Full range | -1.5 | | | -1.5 | | | |
| | | | | $R_L = 600 \Omega$ | 25°C | 80 | 91 | | 80 | 91 | | |
| | | | | | Full range | 79 | | | 79 | | | |
| A _{VD} | Large-signal d | | V _O = ±2.3 V | $R_1 = 2 k\Omega$ | 25°C | 90 | 100 | | 90 | 100 | | dB |
| - VD | voltage amplifi | cation | | | Full range | 89 | | | 89 | | | |
| | | | | $R_L = 10 \text{ k}\Omega$ | 25°C | 95 | 106 | | 95 | 106 | | |
| | | | | | Full range | 94 | | | 94 | | | |
| rį | Input resistand | e | V _{IC} = 0 | | 25°C | | 10 ¹² | | | 10 ¹² | | Ω |
| C. | Input | Common mode | V _{IC} = 0, | See Figure 5 | 25°C | | 11 | | | 11 | | pF |
| c _i | capacitance | Differential | VIC - 0, | Jee i igule 5 | 25°C | | 2.5 | | | 2.5 | | ρı |
| z _o | Open-loop out | put impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMRR | RR Common-mode rejection ratio | $V_{IC} = V_{ICR}mir$ | | 25°C | 70 | 89 | | 70 | 89 | | dB | |
| OIVII II 1 | John Mon-1110u | o rejection ratio | $V_{O} = 0,$ | $R_S = 50 \Omega$ | Full range | 68 | | | 68 | | | UD |
| keys | , | e rejection ratio | $V_{CC\pm} = \pm 5 \text{ V}$ | | 25°C | 82 | 99 | | 82 | 99 | | dB |
| k _{SVR} | $(\Delta V_{CC\pm}/\Delta V_{IO})$ | | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 80 | | | 80 | | | נ |

[†] Full range is -40°C to 85°C.



TLE207x, TLE207xA EXCALIBUR LOW-NOISE HIGH-SPEED JFET-INPUT OPERATIONAL AMPLIFIERS

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TLE2074I electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted) (continued)

| | PARAMETER | TEOT OF | NIDITIONS | - + | Т | LE2074I | | TL | E2074A | .l | |
|-----|-------------------------------------|----------------|-----------------------|------------------|-----|---------|-----|-----|--------|-----|------|
| | PARAMETER | TEST CC | ONDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | Supply current | \ | Nalaad | 25°C | 5.2 | 6.3 | 7.5 | 5.2 | 6.3 | 7.5 | A |
| ICC | (four amplifiers) | $V_{O} = 0$, | No load | Full range | | | 7.5 | | | 7.5 | mA |
| | Crosstalk attenuation | $V_{IC} = 0$, | $R_L = 2 k\Omega$ | 25°C | | 120 | | | 120 | | dB |
| | Object since it as to a to a second | ., . | V _{ID} = 1 V | 0500 | | -35 | | | -35 | | |
| los | Short-circuit output current | $V_O = 0$ | $V_{ID} = -1 V$ | 25°C | | 45 | | | 45 | | mA |

[†] Full range is -40°C to 85°C.

TLE2074I operating characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 5~\text{V}$

| | | | | | Т | LE2074 | l | TL | E2074A | .I | |
|--------------------|--------------------------------------|--|--|------------------|------|--------|-----|------|--------|---------|--------------------|
| | PARAMETER | TEST CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | | | | 25°C | | 35 | | | 35 | | |
| SR+ | Positive slew rate | $V_{O(PP)} = \pm 2.3 \text{V}$ | /, D 01:0 | Full range | 20 | | | 20 | | | V/μs |
| | | $A_{VD} = -1,$ $C_{I} = 100 \text{ pF},$ | | 25°C | | 38 | | | 38 | | |
| SR- | Negative slew rate | , | 3 | Full range | 20 | | | 20 | | | V/μs |
| | Settling time | $H_L = 1 \text{ K}\Omega$, $T_{0.1} \text{ m}V$ | 25°C | | 0.25 | | | 0.25 | | | |
| t _s | Settling time | $R_L = 1 \text{ k}\Omega,$ $C_L = 100 \text{ pF}$ | To 1 mV | 25 C | | 0.4 | | | 0.4 | | μs |
| ., | Equivalent input noise | | f = 10 Hz | 25°C | | 48 | 85 | | 48 | 85 | nV/√ Hz |
| V _n | voltage | f = 10 kHz | 25°C | | 12 | 17 | | 12 | 17 | IIV/∀⊓Z | |
| l _v | Peak-to-peak equivalent | $R_S = 20 \Omega$, See Figure 3 | f = 10 Hz to 10 kHz | 25°C | | 6 | | | 6 | | μV |
| V _{N(PP)} | input noise voltage | | f = 0.1 Hz to 10 Hz | 25 C | | 0.6 | | | 0.6 | | μν |
| In | 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 | $V_{O(PP)} = 5 \text{ V},$ f = 1 kHz, $R_S = 25 \Omega$ | $A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$ | 25°C | 0 | .013% | | 0 | .013% | | |
| B ₁ | Unity-gain bandwidth | $V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | | 9.4 | | | 9.4 | | MHz |
| ВОМ | Maximum output-swing bandwidth | $V_{O(PP)} = 4 \text{ V},$ $R_L = 2 \text{ k}\Omega$, | $A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$ | 25°C | | 2.8 | | | 2.8 | | MHz |
| φ _m | Phase margin at unity gain | $V_{I} = 10 \text{ mV},$ $C_{L} = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | | 56° | | | 56° | | |

[†] Full range is –40°C to 85°C.



TLE2074I electrical characteristics at specified free-air temperature, V_{CC^\pm} = $\pm 15~V$ (unless otherwise noted)

| | DADAMETE | <u> </u> | TEST OF | NOTIONS | - + | Т | LE2074 | | TI | E2074A | NI . | LINUT |
|------------------|---|-----------------------|---|----------------------------|------------------|-------------------|-------------------|------|-------------------|-------------------|------|-------|
| | PARAMETE | н | TEST CO | ONDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| v | Innut offeet velt | | | | 25°C | | -1.6 | 5 | | -0.5 | 3 | m\/ |
| V_{IO} | Input offset volt | age | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 9 | | | 7 | mV |
| α_{VIO} | Temperature co | | $R_S = 50 \Omega$ | | Full range | | 10.1 | 30 | | 10.1 | 30 | μV/°C |
| | land the standard | | | | 25°C | | 15 | 100 | | 15 | 100 | pА |
| I _{IO} | Input offset cur | rent | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 5 | | | 5 | nA |
| | lance Albina account | | See Figure 4 | | 25°C | | 25 | 175 | | 25 | 175 | pА |
| I _{IB} | Input bias curre | ent | | | Full range | | | 10 | | | 10 | nA |
| | Common-mode | e input | | | 25°C | 15 to –11 | 15 to -11.9 | | 15 to –11 | 15 to -11.9 | | |
| V _{ICR} | ICR voltage range | | $R_S = 50 \Omega$ | | Full range | 15 to -10.8 | | | 15 to -10.8 | | | V |
| | | | | | 25°C | 13.8 | 14.1 | | 13.8 | 14.1 | | |
| | | | $I_{O} = -200 \mu\text{A}$ | | Full range | 13.7 | | | 13.7 | | | |
| | Maximum positive peak OM+ output voltage swing | | | 25°C | 13.5 | 13.9 | | 13.5 | 13.9 | | | |
| V _{OM+} | | $I_O = -2 \text{ mA}$ | | Full range | 13.4 | | | 13.4 | | | V | |
| | | | | | 25°C | 11.5 | 12.3 | | 11.5 | 12.3 | | |
| | | | $I_0 = -20 \text{ mA}$ | | Full range | 11.5 | | | 11.5 | | | |
| | | | | | 25°C | -13.8 | -14.2 | | -13.8 | -14.2 | | |
| | | | $I_{O} = 200 \mu A$ | | Full range | -13.7 | | | -13.7 | | | |
| | Maximum nega | itive peak | | | 25°C | -13.5 | -14 | | -13.5 | -14 | | |
| V_{OM-} | output voltage | | $I_O = 2 \text{ mA}$ | | Full range | -13.4 | | | -13.4 | | | V |
| | | | | | 25°C | -11.5 | -12.4 | | -11.5 | -12.4 | | |
| | | | $I_O = 20 \text{ mA}$ | | Full range | -11.5 | | | -11.5 | | | |
| | | | | | 25°C | 80 | 96 | | 80 | 96 | | |
| | | | | $R_L = 600 \Omega$ | Full range | 79 | | | 79 | | | |
| | Large-signal di | fferential | | | 25°C | 90 | 109 | | 90 | 109 | | |
| A_{VD} | voltage amplific | | $V_0 = \pm 10 \text{ V}$ | $R_L = 2 k\Omega$ | Full range | 89 | | | 89 | | | dB |
| | | | | | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | | $R_L = 10 \text{ k}\Omega$ | Full range | 94 | | | 94 | | | |
| r _i | Input resistance | е | V _{IC} = 0 | • | 25°C | | 10 ¹² | | | 10 ¹² | | Ω |
| c _i | Input | Common mode | V _{IC} = 0, | See Figure 5 | 25°C | | 7.5 | | | 7.5 | | рF |
| • | capacitance | Differential | | | 25°C | | 2.5 | | | 2.5 | | |
| z _o | Open-loop outpimpedance | out | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMDD | Common-mode |) | V _{IC} = V _{ICR} min, | , | 25°C | 80 | 98 | | 80 | 98 | | 40 |
| CMRR | rejection ratio | | $V_{O} = 0$, | $R_S = 50 \Omega$ | Full range | 79 | | | 79 | | | dB |
| ı. | Supply-voltage | rejection | $V_{CC\pm} = \pm 5 \text{ V t}$ | o ± 15 V, | 25°C | 82 | 99 | | 82 | 99 | | -10 |
| k _{SVR} | | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 80 | | | 80 | | _ | dB | |

[†] Full range is –40°C to 85°C.



TLE207x, TLE207xA **EXCALIBUR LOW-NOISE HIGH-SPEED** JFET-INPUT OPERATIONAL AMPLIFIERS

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TLE2074I electrical characteristics at specified free-air temperature, V_{CC^\pm} = ± 15 V (unless otherwise noted) (continued)

| | PARAMETER | TEOT 00 | NIDITIONO | -+ | Т | LE2074I | | TL | .E2074A | 1 | |
|-----------------|-----------------------|----------------|-----------------------|------------------|-----|---------|-----|-----|---------|-----|------|
| | PARAMETER | TEST CO | ONDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| I _{CC} | Supply current | V 0 | Nalaad | 25°C | 5.2 | 6.5 | 7.5 | 5.2 | 6.5 | 7.5 | A |
| | (four amplifiers) | $V_{O} = 0$, | No load | Full range | | | 7.5 | | | 7.5 | mA |
| | Crosstalk attenuation | $V_{IC} = 0$, | $R_L = 2 k\Omega$ | 25°C | | 120 | | | 120 | | dB |
| | Short-circuit output | ., . | V _{ID} = 1 V | 0500 | -30 | -45 | | -30 | -45 | | 4 |
| los | current | $V_O = 0$ | $V_{ID} = -1 V$ | 25°C | 30 | 48 | | 30 | 48 | | mA |

[†] Full range is -40°C to 85°C.

TLE2074I operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 15~V$

| | DADAMETED | | IDITIONS | | T | LE2074I | | TL | .E2074A | VI | |
|--------------------|--------------------------------------|---|--|------------------|-----|---------|-----|-----|---------|-----|--------------------|
| | PARAMETER | TEST CON | IDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | | | | 25°C | 25 | 40 | | 25 | 40 | | |
| SR+ | Positive slew rate | $V_{O(PP)} = \pm 10 \text{ V},$ | | Full range | 19 | | | 19 | | | V/μs |
| | | $A_{VD} = -1,$ $C_{L} = 100 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 1 | 25°C | 30 | 45 | | 30 | 45 | | |
| SR- | Negative slew rate | | 3 | Full range | 22 | | | 22 | | | V/μs |
| t _s | Settling time | $A_{VD} = -1,$ 10-V step, | To 10 mV | 25°C | | 0.4 | | | 0.4 | | μs |
| 's | Settling time | $ \begin{array}{c c} R_L = 1 k\Omega, \\ C_L = 100 pF \end{array} \qquad \begin{array}{c} To 1 mV \\ \hline \\ f = 10 Hz \end{array} $ | | 25 0 | | 1.5 | | | 1.5 | | μο |
| \ <u>'</u> | Equivalent input noise | | f = 10 Hz | 25°C | | 48 | 85 | | 48 | 85 | nV/√ Hz |
| V _n | voltage | f | f = 10 kHz | 25°C | | 12 | 17 | | 12 | 17 | IIV/VIIZ |
| V | Peak-to-peak equivalent | <u> </u> | f = 10 Hz to 10 kHz | 25°C | | 6 | | | 6 | | μV |
| V _{N(PP)} | input noise voltage | | f = 0.1 Hz to 10 Hz | 25 C | | 0.6 | | | 0.6 | | μν |
| In | 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 | $V_{O(PP)} = 20 \text{ V},$ $f = 1 \text{ kHz},$ $R_S = 25 \Omega$ | $A_{VD} = 10,$ $R_{L} = 2 k\Omega,$ | 25°C | 0 | .008% | | 0 | .008% | | |
| B ₁ | Unity-gain bandwidth | $V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | 8 | 10 | | 8 | 10 | | MHz |
| B _{OM} | Maximum output-swing bandwidth | $V_{O(PP)} = 20 \text{ V},$ $R_L = 2 \text{ k}\Omega,$ | $A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$ | 25°C | 478 | 637 | | 478 | 637 | | kHz |
| φ _m | Phase margin at unity gain | V ₁ = 10 mV R ₁ = 2 kO | | 25°C | _ | 57° | _ | _ | 57° | _ | |

[†] Full range is -40°C to 85°C.



TLE2074M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted)

| | PARAMETER | | NDITIONS. | | TL | E2074 | VI | TL | E2074A | M | | |
|-----------------------|--|--------------------|--|----------------------------|------------------|-----------------|------------------|-----------------|-----------------|------------------|-----------------|-------|
| | PARAMET | TER | TEST CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| V | loos de affactiva | lt = | | | 25°C | | -1.6 | 5 | | -0.5 | 3 | \/ |
| V_{IO} | Input offset vo | ıtage | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 10.5 | | | 8.5 | mV |
| α_{VIO} | Temperature of input offset | | $R_S = 50\Omega$ | | Full range | | 10.1 | 30 [‡] | | 10.1 | 30 [‡] | μV/°C |
| | l | | | | 25°C | | 15 | 100 | | 15 | 100 | pА |
| I _{IO} | Input offset cu | rrent | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 20 | | | 20 | nA |
| | Innut biog gur | ont. | See Figure 4 | | 25°C | | 20 | 175 | | 20 | 175 | pА |
| I _{IB} | Input bias curr | ent | | | Full range | | | 60 | | | 60 | nA |
| ., | Common-mod | e input | D 50 0 | | 25°C | 5 to -1 | 5 to -1.9 | | 5 to -1 | 5 to -1.9 | | ., |
| V _{ICR} | voltage range | | $R_S = 50 \Omega$ | | Full range | 5 to -0.8 | | | 5 to -0.8 | | | > |
| | | | | | 25°C | 3.8 | 4.1 | | 3.8 | 4.1 | | |
| | | | $I_{O} = -200 \mu\text{A}$ | | Full range | 3.6 | | | 3.6 | | | |
| V | Maximum positive peak output voltage swing | | | | 25°C | 3.5 | 3.9 | | 3.5 | 3.9 | | V |
| V _{OM+} | output voltage | swing | $I_0 = -2 \text{ mA}$ | | Full range | 3.3 | | | 3.3 | | | V |
| | | | J 00 m A | | 25°C | 1.5 | 2.3 | | 1.5 | 2.3 | | |
| | | | $I_O = -20 \text{ mA}$ | | Full range | 1.4 | | | 1.4 | | | |
| | | | I _O = 200 μA | | 25°C | -3.8 | -4.2 | | -3.8 | -4.2 | | |
| | | | 10 = 200 μΑ | | Full range | -3.6 | | | -3.6 | | | |
| V | Maximum neg | | I _O = 2 mA | | 25°C | -3.5 | -4.1 | | -3.5 | -4.1 | | V |
| V_{OM-} | output voltage | swing | 10 - 2 111A | | Full range | -3.3 | | | -3.3 | | | V |
| | | | I _O = 20 mA | | 25°C | -1.5 | -2.4 | | -1.5 | -2.4 | | |
| | | | 10 = 20 IIIA | | Full range | -1.4 | | | -1.4 | | | |
| | | | | $R_L = 600 \Omega$ | 25°C | 80 | 91 | | 80 | 91 | | |
| | | | | 11[= 000 52 | Full range | 78 | | | 78 | | | |
| Δ | Large-signal d | | $V_{O} = \pm 2.3 \text{ V}$ | $R_L = 2 k\Omega$ | 25°C | 90 | 100 | | 90 | 100 | | dB |
| A_{VD} | voltage amplif | ication | VO = ±2.5 V | 11L - 2 KS2 | Full range | 88 | | | 88 | | | uБ |
| | | | | $R_L = 10 \text{ k}\Omega$ | 25°C | 95 | 106 | | 95 | 106 | | |
| | | | | HL = 10 K22 | Full range | 93 | | | 93 | | | |
| rį | Input resistand | ce | $V_{IC} = 0$ | | 25°C | | 10 ¹² | | | 10 ¹² | | Ω |
| | Input | Common mode | ., . | O Fi 5 | 25°C | | 11 | | | 11 | | |
| c _i | capacitance | Differential | $V_{IC} = 0$, | See Figure 5 | 25°C | | 2.5 | | | 2.5 | | pF |
| Z ₀ | Open-loop out | put impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| CMRR | Common was | lo rojection roti- | V _{IC} = V _{ICR} min | , | 25°C | 70 | 89 | | 70 | 89 | | dB |
| CIVIRR | Common-mod | le rejection ratio | $V_{O} = 0,$ | $R_S = 50 \Omega$ | Full range | 68 | | | 68 | | | uB |
| | | e rejection ratio | $V_{CC\pm} = \pm 5 \text{ V t}$ | | 25°C | 82 | 99 | | 82 | 99 | | ٩Đ |
| k _{SVR} | $(\Delta V_{CC\pm}/\Delta V_{IO})$ | | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 80 | | | 80 | | | dB |

[†] Full range is -55°C to 125°C.



[‡] On products compliant to MIL-PRF-38535, Class B, this parameter is not production tested.

TLE207x, TLE207xA **EXCALIBUR LOW-NOISE HIGH-SPEED** JFET-INPUT OPERATIONAL AMPLIFIERS

SLOS181C - FEBRUARY 1997 - REVISED DECEMBER 2009

TLE2074M electrical characteristics at specified free-air temperature, $V_{CC\pm}$ = ± 5 V (unless otherwise noted) (continued)

| | DADAMETED | TEOT 00 | NDITIONO | - + | TL | E2074 | M | TL | E2074A | M | |
|-----|-------------------------------|----------------|-----------------------|------------------|-----|-------|-----|-----|--------|-----|------|
| | PARAMETER | IESI CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | Supply current | V 0 | Nalaad | 25°C | 5.2 | 6.3 | 7.5 | 5.2 | 6.3 | 7.5 | А |
| ICC | (four amplifiers) | $V_{O} = 0$, | No load | Full range | | | 7.5 | | | 7.5 | mA |
| | Crosstalk attenuation | $V_{IC} = 0$, | $R_L = 2 k\Omega$ | 25°C | | 120 | | | 120 | | dB |
| | Object size it so to describe | | V _{ID} = 1 V | 0500 | | -35 | | | -35 | | 4 |
| IOS | Short-circuit output current | $V_O = 0$ | $V_{ID} = -1 V$ | 25°C | | 45 | | | 45 | | mA |

[†] Full range is –55°C to 125°C.

TLE2074M operating characteristics at specified free-air temperature, $V_{CC\pm}$ = $\pm 5~V$

| | | | | - + | T | LE2074N | Л | TLI | E2074AI | M | |
|--------------------|--------------------------------------|--|--|------------------|-----------------|---------|-----------------|-----------------|---------|-----------------|--------------------|
| | PARAMETER | TEST CON | IDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | | | | 25°C | | 35 | | | 35 | | |
| SR+ | Positive slew rate | $V_{O(PP)} = \pm 2.3 \text{ V}$ | | Full range | 18 [‡] | | | 18 [‡] | | | V/μs |
| | | $A_{VD} = -1,$ $C_{L} = 100 \text{ pF},$ | See Figure 1 | 25°C | | 38 | | | 38 | | |
| SR- | Negative slew rate | 12 11 7 | J | Full range | 18 [‡] | | | 18 [‡] | | | V/μs |
| • | Settling time | | | 25°C | | 0.25 | | | 0.25 | | |
| t _s | Settling time | | | 25 C | | 0.4 | | | 0.4 | | μs |
| | Equivalent input noise | | | 25°C | | 48 | 85 [‡] | | 48 | 85 [‡] | nV/√ Hz |
| V _n | voltage | f = 10 | f = 10 kHz | 25 C | | 12 | 17 [‡] | | 12 | 17 [‡] | IIV/ VIIZ |
| | Peak-to-peak equivalent | $R_S = 20 \Omega$, $f = 1$ | f = 10 Hz to 10 kHz | 0500 | | 6 | | | 6 | | ,, |
| V _{N(PP)} | input noise voltage | | f = 0.1 Hz to 10 Hz | 25°C | | 0.6 | | | 0.6 | | μV |
| In | 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 | $V_{O(PP)} = 5 \text{ V},$ f = 1 kHz, $R_S = 25 \Omega$ | $A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$ | 25°C | (|).013% | | 0 | .013% | | |
| B ₁ | Unity-gain bandwidth | $V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | | 9.4 | | | 9.4 | | MHz |
| B _{OM} | Maximum output-swing bandwidth | $V_{O(PP)} = 4 \text{ V},$ $R_L = 2 \text{ k}\Omega,$ | $A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$ | 25°C | | 2.8 | | | 2.8 | | MHz |
| f _m | Phase margin at unity gain | $V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | | 56° | | | 56° | | |

[†] Full range is -55°C to 125°C.



[‡] On products compliant to MIL-PRF-38535, Class B, this parameter is not production tested.

TLE2074M electrical characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 15~\text{V}$ (unless otherwise noted)

| | | | | | | T | _E2074I | И | TL | E2074A | M | |
|-----------------------|-----------------------------|--------------------|--|----------------------------|------------------|-------------------|-------------------|-----------------|-------------------|-------------------|-----------------|-------|
| | PARAME | TER | TEST CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| v | lanut affact | -14 | | | 25°C | | -1.6 | 5 | | -0.5 | 3 | \/ |
| V_{IO} | Input offset vo | ortage | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 10.5 | | | 8.5 | mV |
| α_{VIO} | Temperature of input offset | | $R_S = 50 \Omega$ | | Full range | | 10.1 | 30 [‡] | | 10.1 | 30 [‡] | μV/°C |
| | | | | | 25°C | | 15 | 100 | | 15 | 100 | pА |
| I _{IO} | Input offset cu | urrent | $V_{IC} = 0$, | $V_{O} = 0$, | Full range | | | 20 | | | 20 | nA |
| | land the second | | See Figure 4 | | 25°C | | 25 | 175 | | 25 | 175 | pА |
| I _{IB} | Input bias cur | rent | | | Full range | | | 60 | | | 60 | nA |
| | Common-moo | de input | | | 25°C | 15 to –11 | 15 to -11.9 | | 15 to –11 | 15 to -11.9 | | |
| V _{ICR} | voltage range | · | $R_S = 50 \Omega$ | | Full range | 15 to -10.8 | | | 15 to -10.8 | | | V |
| | | | | | 25°C | 13.8 | 14.1 | | 13.8 | 14.1 | | |
| | | | $I_{O} = -200 \mu\text{A}$ | | Full range | 13.6 | | | 13.6 | | | |
| l., | Maximum pos | sitive peak | | | 25°C | 13.5 | 13.9 | | 13.5 | 13.9 | | ., |
| V _{OM+} | output voltage | e swing | $I_0 = -2 \text{ mA}$ | | Full range | 13.3 | | | 13.3 | | | V |
| | | | | | 25°C | 11.5 | 12.3 | | 11.5 | 12.3 | | |
| | | | $I_O = -20 \text{ mA}$ | | Full range | 11.4 | | | 11.4 | | | |
| | | | J 000 A | | 25°C | -13.8 | -14.2 | | -13.8 | -14.2 | | |
| | | | I _O = 200 μA | | Full range | -13.6 | | | -13.6 | | | |
| ., | Maximum neg | gative peak | | | 25°C | -13.5 | -14 | | -13.5 | -14 | | V |
| V_{OM-} | output voltage | e swing | $I_O = 2 \text{ mA}$ | | Full range | -13.3 | | | -13.3 | | | V |
| | | | 1 00 mA | | 25°C | -11.5 | -12.4 | | -11.5 | -12.4 | | |
| | | | $I_O = 20 \text{ mA}$ | | Full range | -11.4 | | | -11.4 | | | |
| | | | | B 600 O | 25°C | 80 | 96 | | 80 | 96 | | |
| | | | | $R_L = 600 \Omega$ | Full range | 78 | | | 78 | | | |
| _ | Large-signal | differential | V 110 V | D 0k0 | 25°C | 90 | 109 | | 90 | 109 | | dB |
| A_{VD} | voltage ampli | fication | $V_{O} = \pm 10 \text{ V}$ | $R_L = 2 k\Omega$ | Full range | 88 | | | 88 | | | uБ |
| | | | | D 1010 | 25°C | 95 | 118 | | 95 | 118 | | |
| | | | | $R_L = 10 \text{ k}\Omega$ | Full range | 93 | | | 93 | | | |
| ri | Input resistan | се | V _{IC} = 0 | | 25°C | | 10 ¹² | | | 10 ¹² | | Ω |
| | Input | Common mode | | | 25°C | | 7.5 | | | 7.5 | | _ |
| Ci | capacitance | Differential | $V_{IC} = 0$, | See Figure 5 | 25°C | | 2.5 | | | 2.5 | | pF |
| z _o | Open-loop ou | tput impedance | f = 1 MHz | | 25°C | | 80 | | | 80 | | Ω |
| | _ | | V _{IC} = V _{ICR} mir | າ, | 25°C | 80 | 98 | | 80 | 98 | | |
| CMRR | Common-mod | de rejection ratio | $V_O = 0$, | $R_S = 50 \Omega$ | Full range | 78 | | | 78 | | | dB |
| | Supply-voltag | e rejection | $V_{CC\pm} = \pm 5 \text{ V}$ | to ±15 V, | 25°C | 82 | 99 | | 82 | 99 | | |
| k _{SVR} | ratio (ΔV _{CC±} / | | $V_{O} = 0$, | $R_S = 50 \Omega$ | Full range | 80 | | | 80 | | | dB |

[†] Full range is –55°C to 125°C.



[‡] On products compliant to MIL-PRF-38535, Class B, this parameter is not production tested.

TLE207x, TLE207xA **EXCALIBUR LOW-NOISE HIGH-SPEED** JFET-INPUT OPERATIONAL AMPLIFIERS

SLOS181C - FEBRUARY 1997 - REVISED DECEMBER 2009

TLE2074M electrical characteristics at specified free-air temperature, V_{CC^\pm} = $\pm 15~V$ (unless otherwise noted) (continued)

| | DADAMETED | TEOT 001 | NDITIONO | - + | TL | E2074 | И | TL | E2074A | М | |
|-----------------|----------------------------------|----------------|-------------------|------------------|-----|-------|-----|-----|--------|-----|------|
| | PARAMETER | IEST CO | NDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | Supply current | V 0 | Nalaad | 25°C | 5.2 | 6.5 | 7.5 | 5.2 | 6.5 | 7.5 | A |
| I _{CC} | (four amplifiers) | $V_{O} = 0$, | No load | Full range | | | 7.5 | | | 7.5 | mA |
| | Crosstalk attenuation | $V_{IC} = 0$, | $R_L = 2 k\Omega$ | 25°C | | 120 | | | 120 | | dB |
| | Oh aut aine iit autuu ta auurant | V 0 | $V_{ID} = 1 V$ | 0500 | -30 | -45 | | -30 | -45 | | A |
| IOS | Short-circuit output current | $V_O = 0$ | $V_{ID} = -1 V$ | 25°C | 30 | 48 | | 30 | 48 | | mA |

[†] Full range is -55°C to 125°C.

TLE2074M operating characteristics at specified free-air temperature, $V_{\text{CC}\pm}$ = $\pm 15~\text{V}$

| | | | | - + | TL | E2074N | Л | TL | E2074A | M | |
|--------------------|--------------------------------------|---|--|------------------|------------------|-----------------|-----------------|------------------|-----------------|--------------------|--------------------|
| | PARAMETER | TEST CON | IDITIONS | T _A † | MIN | TYP | MAX | MIN | TYP | MAX | UNIT |
| | | | | 25°C | 25 | 40 | | 25 | 40 | | |
| SR+ | Positive slew rate | $V_{O(PP)} = 10 \text{ V},$ | | Full range | 17 | | | 17 | | | V/μs |
| | | $R_L = 2 kΩ$, See Figure 1 | C _L = 100 pr, | 25°C | 30 | 45 | | 30 | 45 | | |
| SR- | Negative slew rate | July 1941 | | Full range | 20 | | | 20 | | | V/μs |
| t _s | Settling time | $A_{VD} = -1,$ 10-V step, | To 10 mV | 25°C | | 0.4 | | | 0.4 | | μs |
| is | Setting time | $R_L = 1 k\Omega$, $C_L = 100 pF$ | To 1 mV | | | 1.5 | | | 1.5 | | μο |
| \ / | Equivalent input noise | | f = 10 Hz | ر دور | 3 48 | 85 [‡] | | 48 | 85 [‡] | nV/√ Hz | |
| V _n | voltage | | f = 10 kHz | 25°C | | 12 | 17 [‡] | | 12 | 17 [‡] | IIV/√⊓Z |
| V | Peak-to-peak equivalent | $R_S = 20 \Omega$, See Figure 3 | f = 10 Hz to 10 kHz | 0500 | | 6 | | | 6 | | ., |
| V _{N(PP)} | input noise voltage | | f = 0.1 Hz to 10 Hz | 25°C | | 0.6 | | | 0.6 | | μV |
| 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 | $V_{O(PP)} = 20 \text{ V},$ f = 1 kHz, $R_S = 25 \Omega$ | $A_{VD} = 10,$ $R_L = 2 \text{ k}\Omega,$ | 25°C | | | | 0 | .008% | | |
| B ₁ | Unity-gain bandwidth | $V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | 8 [‡] | 10 | | 8 [‡] | 10 | | MHz |
| ВОМ | Maximum output-swing bandwidth | $V_{O(PP)} = 20 \text{ V},$ $R_L = 2 \text{ k}\Omega,$ | $A_{VD} = -1,$ $C_{L} = 25 \text{ pF}$ | 25°C | 478 [‡] | 637 | | 478 [‡] | 637 | | kHz |
| фm | Phase margin at unity gain | $V_I = 10 \text{ mV},$ $C_L = 25 \text{ pF},$ | $R_L = 2 k\Omega$, See Figure 2 | 25°C | | 57° | _ | _ | 57° | _ | |

[†] Full range is –55°C to 125°C.

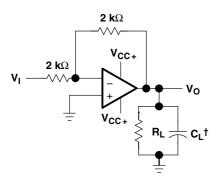


[‡] On products compliant to MIL-PRF-38535, Class B, this parameter is not production tested.

TLE2074Y electrical characteristics at V_{CC^\pm} = ± 15 V, T_A = 25°C (unless otherwise noted)

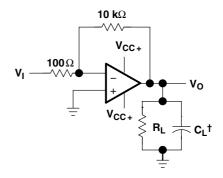
| | PARAMETER | TEST OF | TEST CONDITIONS | | | TLE2074Y | | | |
|------------------|--|---------------------------|--|--------------------------------|------------------|------------------|-----|------|--|
| | PARAMETER | | lesi co | ONDITIONS | MIN | TYP | MAX | UNIT | |
| V _{IO} | Input offset voltage | | $V_{IC} = 0,$ $R_S = 50 \Omega$ | $V_O = 0$, | | | 5 | mV | |
| I _{IO} | Input offset current | | $V_{IC} = 0$, | V _O = 0, | | 15 | 100 | pА | |
| I _{IB} | Input bias current | | See Figure 4 | | | 25 | 175 | pА | |
| V _{ICR} | Common-mode input voltage range | | $R_S = 50 \Omega$ | 15 to –11 | 15 to 11.9 | | ٧ | | |
| | | | $I_{O} = -200 \mu A$ | | 13.8 | 14.1 | | | |
| V_{OM+} | Maximum positive peak output volta | ge swing | $I_O = -2 \text{ mA}$ | | 13.5 | 13.9 | | V | |
| | | | $I_O = -20 \text{ mA}$ | 11.5 | 12.3 | | | | |
| | | | $I_O = 200 \mu\text{A}$ | -13.8 | -14.2 | | V | | |
| V_{OM-} | Maximum negative peak output volta | age swing | I _O = 2 mA | | -13.5 | -14 | | | |
| | | | I _O = 20 mA | -11.5 | -12.4 | | | | |
| | | | V _O = ±10 V | $R_L = 600 \Omega$ | 80 | 96 | | | |
| A_{VD} | Large-signal differential voltage amp | olification | | $R_L = 2 k\Omega$ | 90 | 109 | | dB | |
| | typ Large signal uniciential voltage arripinically | | | $R_L = 10 \text{ k}\Omega$ | 95 118 | | | | |
| rį | Input resistance | | $V_{IC} = 0$ | | | 10 ¹² | | Ω | |
| c _i | Input capacitance | Common mode Differential | V _O = 0, | See Figure 5 | | 7.5 2.5 | | pF | |
| z _o | Open-loop output impedance | • | f = 1 MHz | | | 80 | | Ω | |
| CMRR | Common-mode rejection ratio | | $V_{IC} = V_{ICR}$ min, $R_S = 50 \Omega$ | $V_O = 0$, | 80 | 98 | | dB | |
| k _{SVR} | Supply-voltage rejection ratio (ΔV _{CC} | $_{1\pm}/\Delta V_{IO}$) | $V_{CC\pm} = \pm 5 \text{ V to } \pm 1$ $V_{O} = 0$, | 15 V, R _S = 50 Ω | 82 | 99 | | dB | |
| I _{CC} | Supply current (four amplifiers) | | $V_O = 0$, | No load | 5.2 | 6.5 | 7.5 | mA | |
| | Chart aircuit autaut aurrent | | l | V _{ID} = 1 V | -30 | -45 | | A | |
| los | Short-circuit output current | | V _O = 0 | $V_{ID} = -1 V$ | 30 | 48 | | mA | |

PARAMETER MEASUREMENT INFORMATION



† Includes fixture capacitance

Figure 1. Slew-Rate Test Circuit

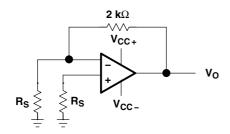


† Includes fixture capacitance

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



PARAMETER MEASUREMENT INFORMATION



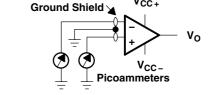


Figure 3. Noise-Voltage Test Circuit

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

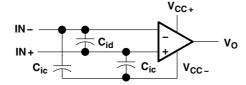


Figure 5. Internal Input Capacitance

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 TLE207x and TLE207xA, accurate measurement of the bias current 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.

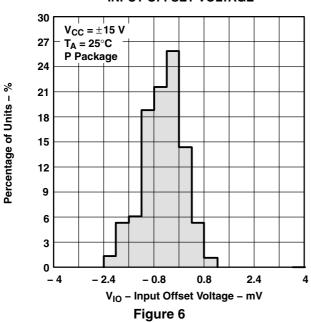
Table of Graphs

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| | Crosstalk attenuation | vs Frequency | 69 |



Percentage of Units - %

DISTRIBUTION OF TLE2071 INPUT OFFSET VOLTAGE



DISTRIBUTION OF TLE2072 INPUT OFFSET VOLTAGE

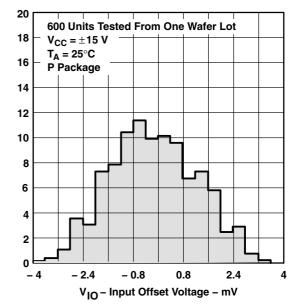
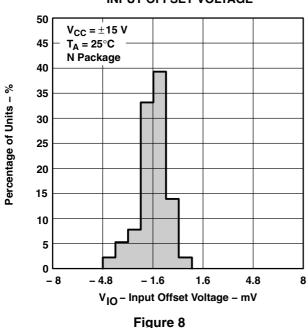


Figure 7

DISTRIBUTION OF TLE2074 INPUT OFFSET VOLTAGE



DISTRIBUTION OF TLE2071 INPUT OFFSET VOLTAGE TEMPERATURE COEFFICIENT

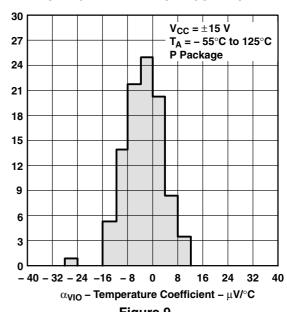
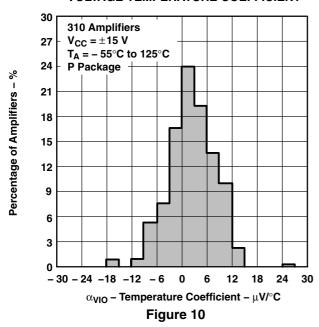


Figure 9

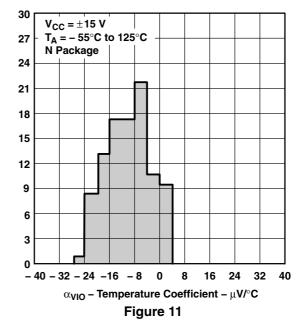
Percentage of Amplifiers –

Percentage of Amplifiers –

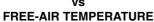
DISTRIBUTION OF TLE2072 INPUT OFFSET VOLTAGE TEMPERATURE COEFFICIENT

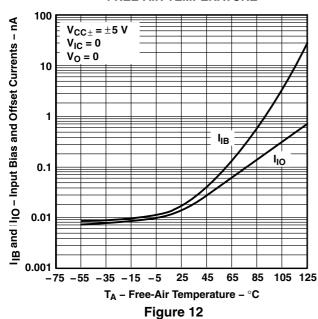


DISTRIBUTION OF TLE2074 INPUT OFFSET VOLTAGE TEMPERATURE COEFFICIENT



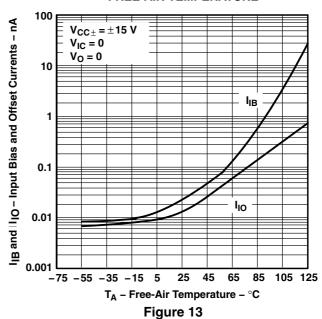
INPUT BIAS CURRENT AND INPUT OFFSET CURRENT† vs





INPUT BIAS CURRENT AND INPUT OFFSET CURRENT†

FREE-AIR TEMPERATURE

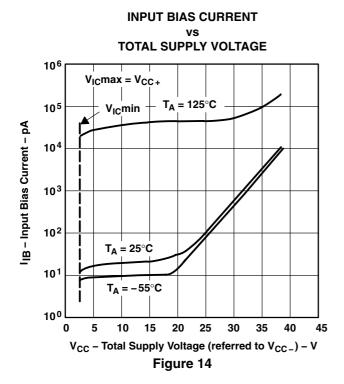


[†] Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.



COMMON-MODE INPUT VOLTAGE RANGE†

TYPICAL CHARACTERISTICS



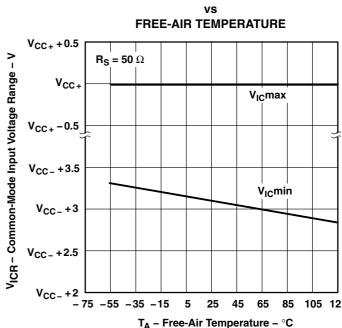
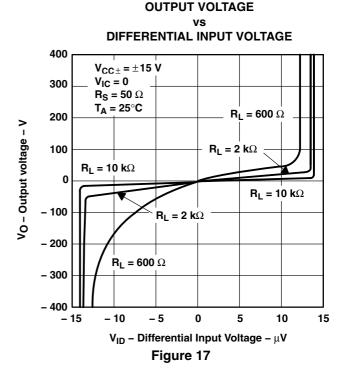


Figure 15

OUTPUT VOLTAGE vs **DIFFERENTIAL INPUT VOLTAGE** 400 $V_{CC\pm} = \pm 5 V$ $V_{IC} = 0$ 300 $R_S = 50 \Omega$ T_A = 25°C $R_L = 600 \Omega$ 200 Vo - Output voltage - V 100 $R_L = 2 k\Omega$ $R_L = 10 \text{ k}\Omega$ 0 $R_L = 10 \text{ k}\Omega$ - 100 $R_1 = 2 k\Omega$ - 200 $R_L = 600 \Omega$ - 300 - 400 -2 -10 0 - 3 3 V_{ID} - Differential Input Voltage - μV Figure 16



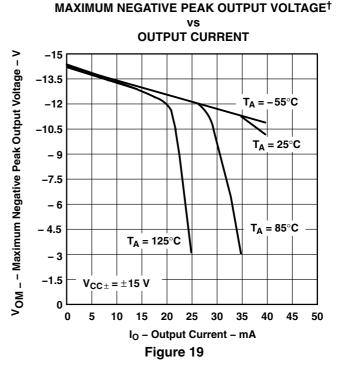
[†] Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.



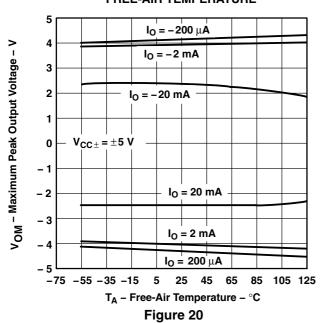
MAXIMUM POSITIVE PEAK OUTPUT VOLTAGE† OUTPUT CURRENT 15 V_{OM+}- Maximum Positive Peak Output Voltage - V 13.5 12 $T_{\Delta} = -55^{\circ}C$ 10.5 9 7.5 T_A = 25°C T_A = 125°C 4.5 $T_{\Delta} = 85^{\circ}C$ 3 1.5 $V_{CC\pm} = \pm 15 \text{ V}$ 0 -5 -10 -15 -20 -25 -30 -35 -40 -45 -50

Figure 18

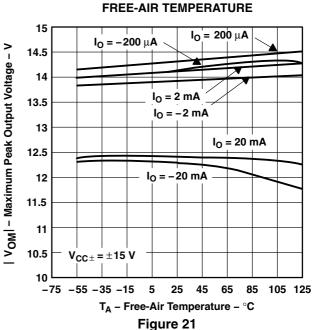
IO - Output Current - mA



MAXIMUM PEAK OUTPUT VOLTAGE[†] FREE-AIR TEMPERATURE



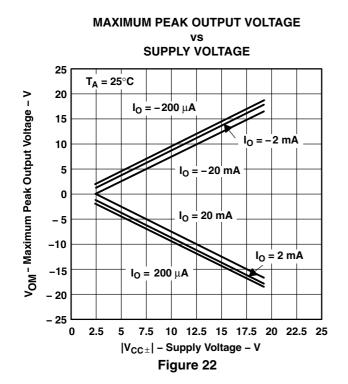
MAXIMUM PEAK OUTPUT VOLTAGE†

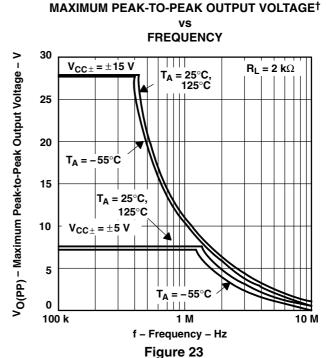


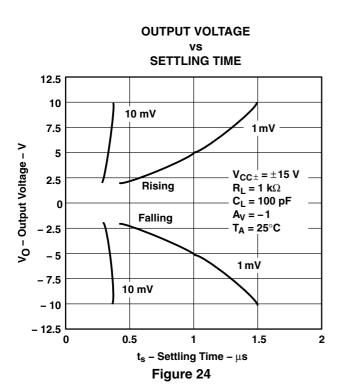
[†] Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

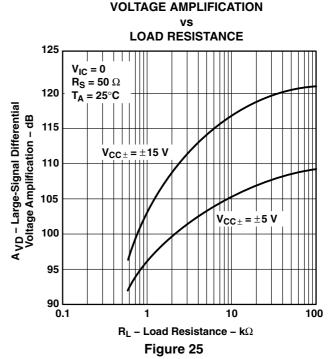


TYPICAL CHARACTERISTICS









LARGE-SIGNAL DIFFERENTIAL

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



LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION[†]

FREE-AIR TEMPERATURE

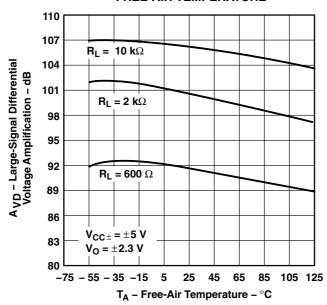


Figure 26

LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION[†]

vs FREE-AIR TEMPERATURE

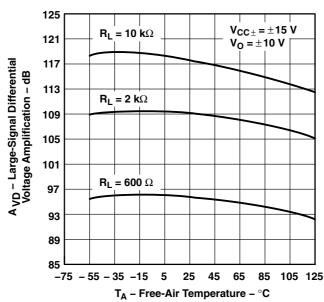


Figure 27

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



SMALL-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT

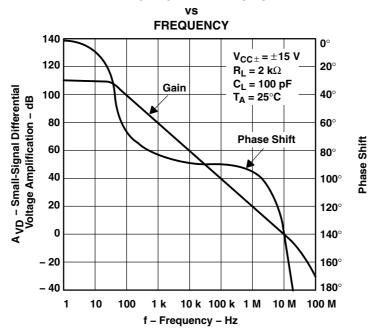


Figure 28

SMALL-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT

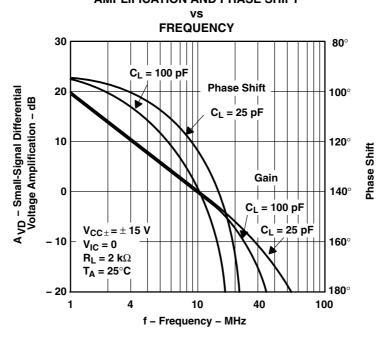
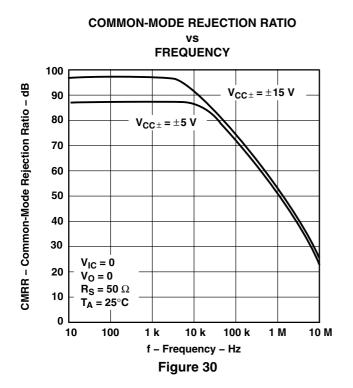
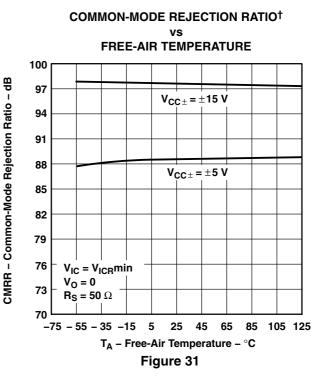
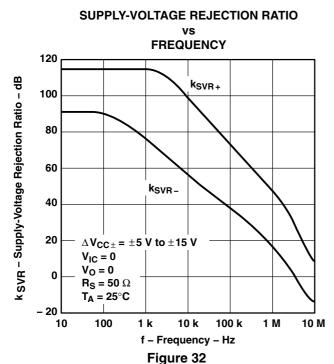


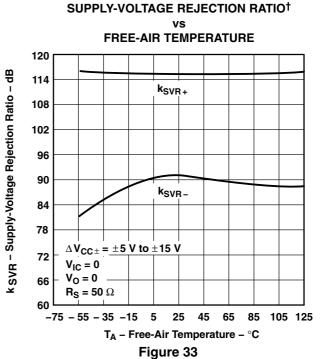
Figure 29





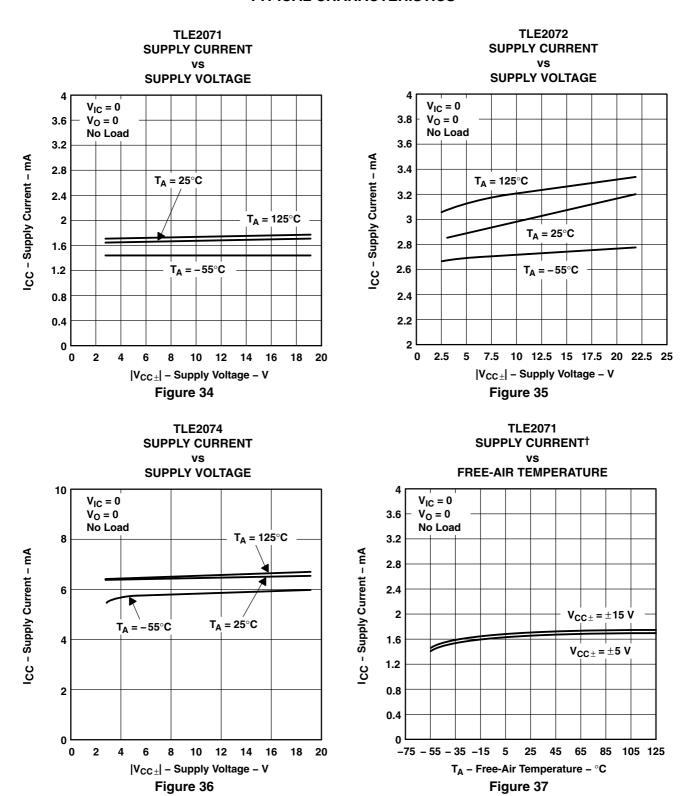






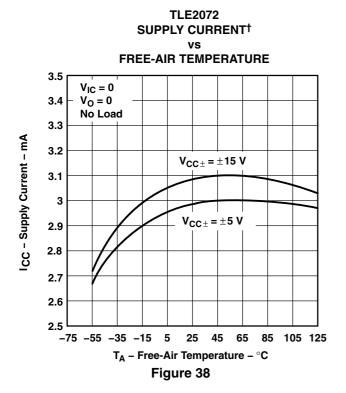
[†] Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

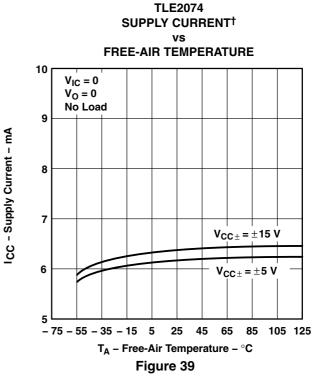


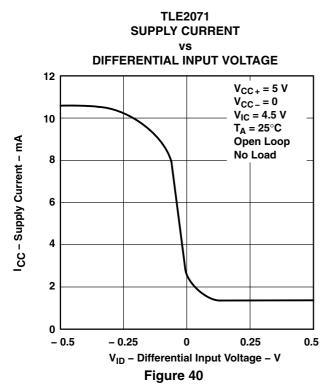


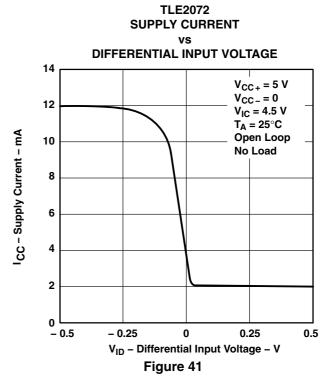
[†] Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.





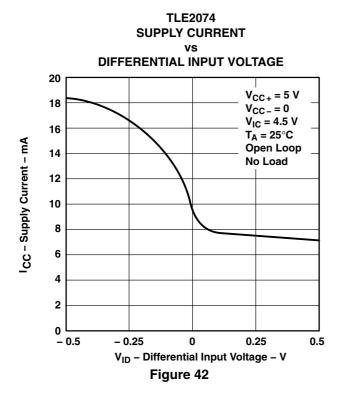


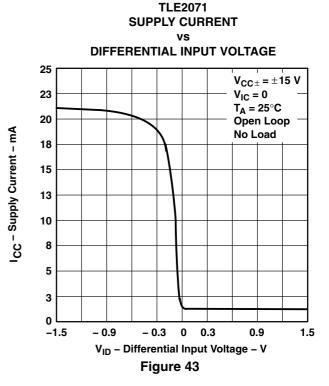


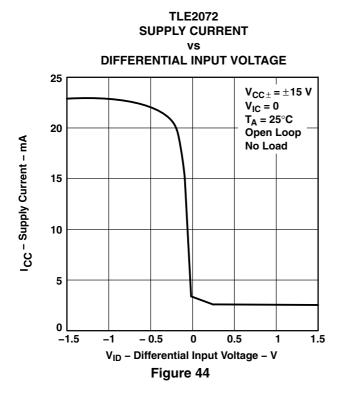


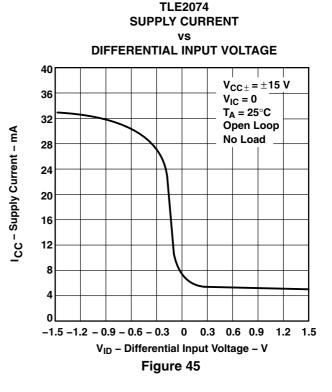
[†] Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.



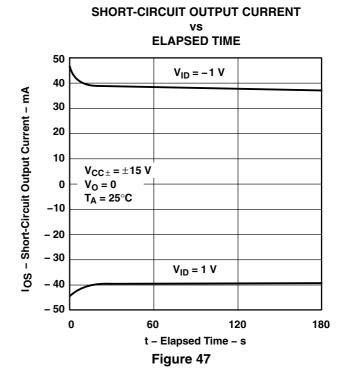


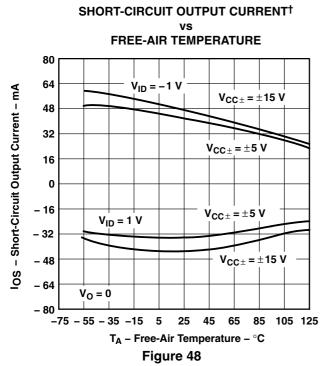


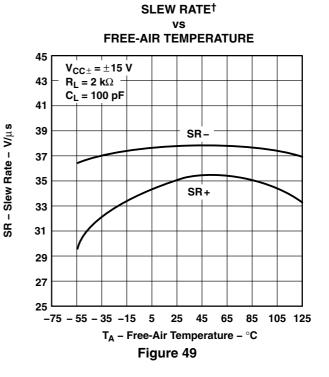




SHORT-CIRCUIT OUTPUT CURRENT VS **SUPPLY VOLTAGE** 60 48 IOS - Short-Circuit Output Current - mA $V_{ID} = -1 V$ 36 24 12 $V_0 = 0$ 0 $T_A = 25^{\circ}C$ -12 - 24 $V_{ID} = 1 V$ - 36 - 48 - 60 2.5 5 7.5 10 12.5 15 17.5 20 22.5 25 |V_{CC±}| - Supply Voltage - V Figure 46



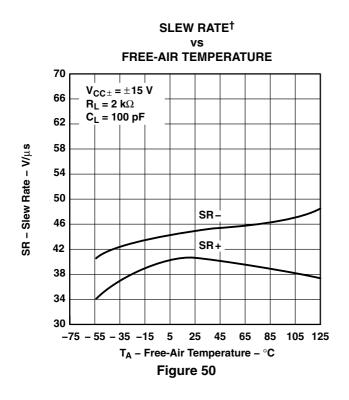


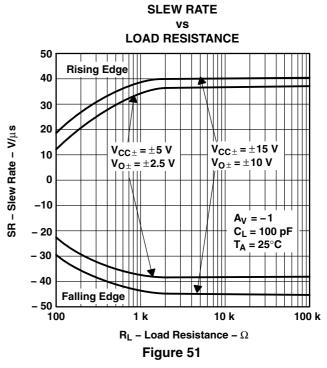


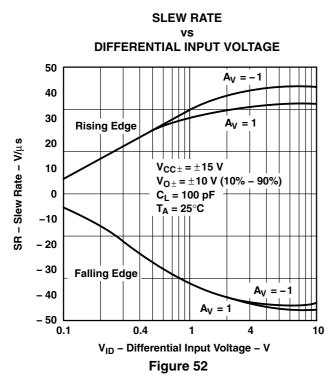
[†] Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.



TYPICAL CHARACTERISTICS







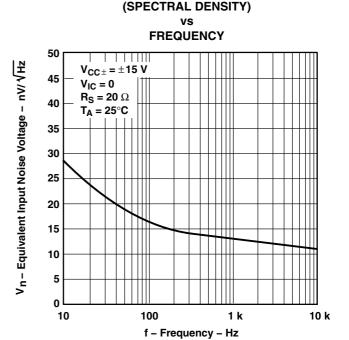


Figure 53

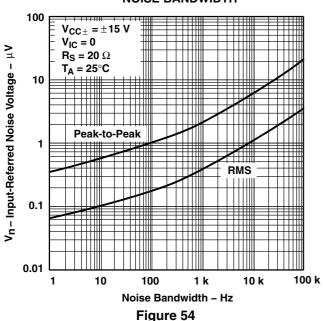
EQUIVALENT INPUT NOISE VOLTAGE

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

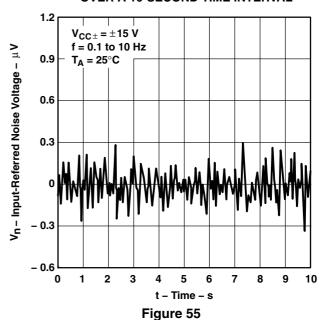


INPUT-REFERRED NOISE VOLTAGE

NOISE BANDWIDTH

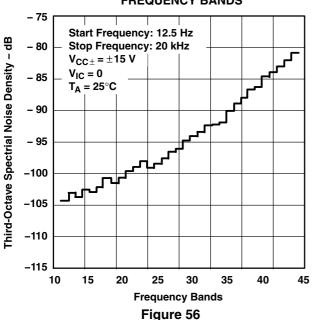


INPUT-REFERRED NOISE VOLTAGE OVER A 10-SECOND TIME INTERVAL



THIRD-OCTAVE SPECTRAL NOISE DENSITY

FREQUENCY BANDS



TOTAL HARMONIC DISTORTION PLUS NOISE

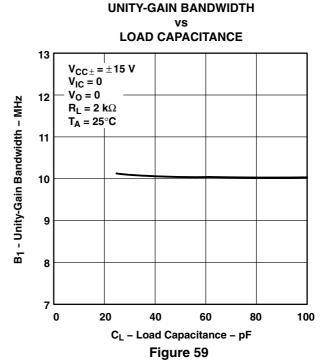
vs **FREQUENCY** THD + N - Total Harmonic Distortion + Noise - % $A_V = 100, R_L = 600 \Omega$ 0.1 $A_V = 100$, $R_L = 2 k\Omega$ $A_V = 10, R_L = 600 \Omega$ $A_V = 10, R_L = 2 k\Omega$ 0.01 $V_{CC\pm} = \pm 5 V$ $V_{O(PP)} = 5 V$ $T_A = 25^{\circ}C$ Filter: 10-Hz to 500-kHz Band Pass 0.001 10 100 10 k 100 k f - Frequency - Hz

Figure 57



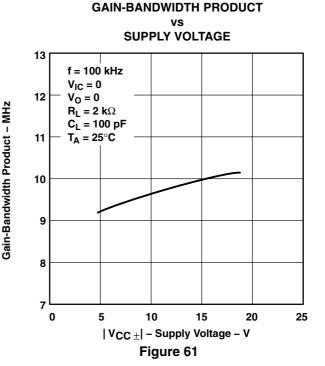
TYPICAL CHARACTERISTICS

TOTAL HARMONIC DISTORTION PLUS NOISE vs **FREQUENCY** THD + N - Total Harmonic Distortion + Noise - % Filter: 10-Hz to 500-kHz Band Pass $V_{CC\pm} = \pm 15 \text{ V}$ $V_{O(PP)} = 20 V$ $T_A = 25^{\circ}C$ 0.1 $A_V = 100$, $R_L = 600 \Omega$ $A_V = 100, R_1 = 2 k\Omega$ $A_V = 10, R_L = 600 \Omega$ 0.01 $A_V = 10$, $R_L = 2 k\Omega$ 0.001 10 100 1 k 10 k 100 k f - Frequency - Hz Figure 58



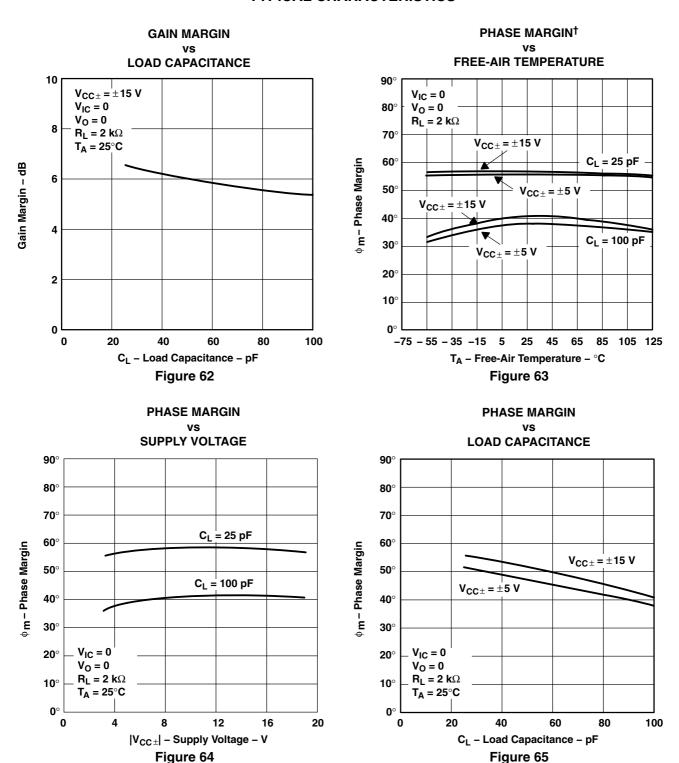
GAIN-BANDWIDTH PRODUCT† FREE-AIR TEMPERATURE 13 f = 100 kHz $V_{IC} = 0$ $V_0 = 0$ 12 $R_L = 2 k\Omega$ Gain-Bandwidth Product - MHz $C_L = 100 pF$ 11 $V_{CC\pm} = \pm 15 \text{ V}$ 10 $V_{CC\pm} = \pm 5 \text{ V}$ 9 8 -75 - 55 - 35 -15 5 25 45 65 85 105 125 T_A - Free-Air Temperature - °C

Figure 60



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





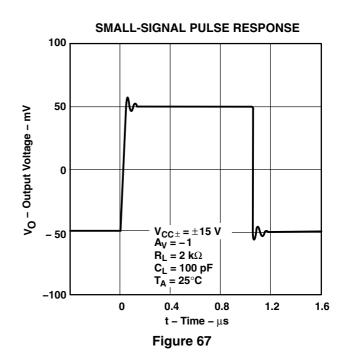
[†] Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

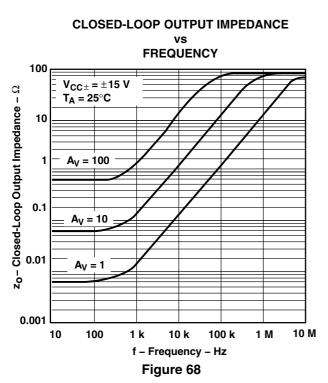


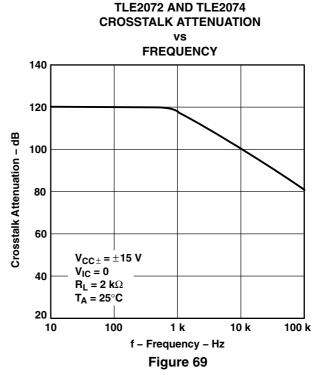
TYPICAL CHARACTERISTICS

NONINVERTING LARGE-SIGNAL PULSE RESPONSE† 15 T_A = 25°C, 125°C 10 $T_A = -55^{\circ}C$ V_O - Output Voltage - V $T_A = -55^{\circ}C$ 5 $T_A = 25^{\circ}C$ 125°C $V_{CC\pm} = \pm 15 \text{ V}$ $A_V = 1$ -10 $R_L = 2 k\Omega$ $C_{L} = 100 pF$ 0 2 t – Time – μ s

Figure 66







[†] 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 TLE207xA, and TLE207xB 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 TLE207x, TLE207xA, and TLE207xB 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 70). These guards should be driven from a low-impedance source at the same voltage level as the common-mode input.

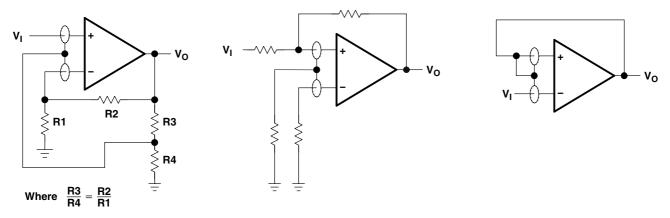


Figure 70. Use of Guard Rings

TLE2071 input offset voltage nulling

The TLE2071 series offers external null pins that can be used to further reduce the input offset voltage. The circuit of Figure 71 can be connected as shown if the feature is desired. When external nulling is not needed, the null pins may be left unconnected.

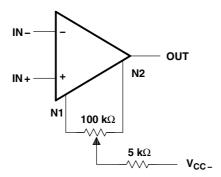


Figure 71. Input Offset Voltage Nulling



APPLICATION INFORMATION

macromodel information

Macromodel information provided was derived using $PSpice^{TM}$ Parts model generation software. The Boyle macromodel (see Note 4) and subcircuit Figure 72 were generated using the TLE207x typical electrical and operating characteristics at $T_A = 25^{\circ}C$. 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).

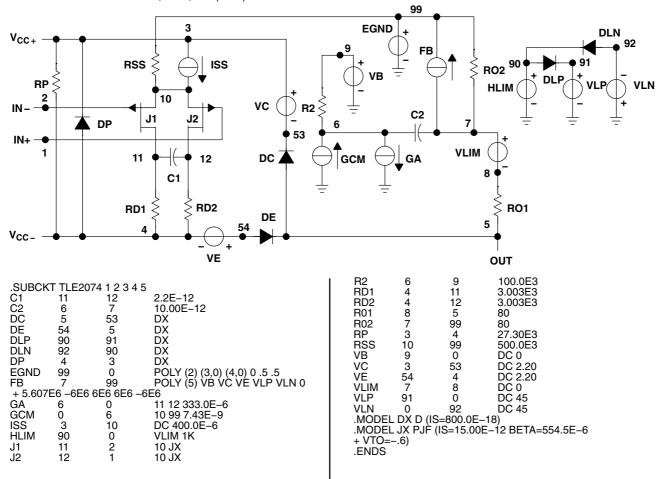


Figure 72. Boyle Macromodel and Subcircut

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TLE207x, TLE207xA EXCALIBUR LOW-NOISE HIGH-SPEED JFET-INPUT OPERATIONAL AMPLIFIERS SLOS181C – FEBRUARY 1997 – REVISED DECEMBER 2009

Revision History

| Version | Date | Changes |
|---------|----------|--|
| С | Dec-2009 | $-$ For TLE2071M/1AM (VCC \pm 5V) changed V _n NOM & MAX from 28/55 to 48/85 (f = 10 Hz); 11.6/17 to 12/17 (f = 10 KHz), Pg. 16 |
| | | $-$ For TLE2071M/1AM (VCC \pm 15V) changed V _n NOM & MAX from 28/55 to 48/85 (f = 10 Hz); 11.6/17 to 12/17 (f = 10 KHz), Pg. 18 |
| | | $-$ For TLE2072M/2AM (VCC \pm 5V) changed V _n NOM & MAX from 28/55 to 48/85 (f = 10 Hz); 11.6/17 to 12/17 (f = 10 KHz), Pg. 29 |
| | | $-$ For TLE2072M/2AM (VCC \pm 15V) changed V $_{\rm n}$ NOM & MAX from 28/55 to 48/85 (f = 10 Hz); 11.6/17 to 12/17 (f = 10 KHz), Pg. 31 |
| | | $-$ For TLE2074M/4AM (VCC \pm 5V) changed V _n NOM & MAX from 28/55 to 48/85 (f = 10 Hz); 11.6/17 to 12/17 (f = 10 KHz), Pg. 42 |
| | | $-$ For TLE2074M/4AM (VCC \pm 15V) changed V _n NOM & MAX from 28/55 to 48/85 (f = 10 Hz); 11.6/17 to 12/17 (f = 10 KHz), Pg. 44 |







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PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan | Lead finish/ Ball material | MSL Peak Temp | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|------------|--------------|--------------------|------|----------------|---------------------|-------------------------------|--------------------|--------------|---|---------|
| 5962-9460201Q2A | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962- 9460201Q2A TLE2071 MFKB | Samples |
| 5962-9460201QPA | ACTIVE | CDIP | JG | 8 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 9460201QPA TLE2071M | Samples |
| 5962-9460202Q2A | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962- 9460202Q2A TLE2072 MFKB | Samples |
| 5962-9460202QHA | ACTIVE | CFP | U | 10 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 9460202QHA TLE2072M | Samples |
| 5962-9460202QPA | ACTIVE | CDIP | JG | 8 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 9460202QPA TLE2072M | Samples |
| 5962-9460203Q2A | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962- 9460203Q2A TLE2074 MFKB | Samples |
| 5962-9460203QCA | ACTIVE | CDIP | J | 14 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-9460203QC A TLE2074MJB | Samples |
| 5962-9460204Q2A | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962 9460204Q2A TLE2071 AMFKB | Samples |
| 5962-9460204QHA | ACTIVE | CFP | U | 10 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 9460204QHA TLE2071AM | Samples |
| 5962-9460204QPA | ACTIVE | CDIP | JG | 8 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 9460204QPA TLE2071AM | Samples |
| 5962-9460205Q2A | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962- 9460205Q2A TLE2072 AMFKB | Samples |
| 5962-9460205QHA | ACTIVE | CFP | U | 10 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 9460205QHA TLE2072AM | Samples |





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| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material | MSL Peak Temp | Op Temp (°C) | Device Marking (4/5) | Samp |
|------------------|------------|--------------|--------------------|------|----------------|-------------------------|-------------------------------|--------------------|--------------|---|-------|
| 5962-9460205QPA | ACTIVE | CDIP | JG | 8 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 9460205QPA TLE2072AM | Sampl |
| 5962-9460206Q2A | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962- 9460206Q2A TLE2074 AMFKB | Sampl |
| 5962-9460206QCA | ACTIVE | CDIP | J | 14 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-9460206QC A TLE2074AMJB | Sampl |
| 5962-9460206QDA | ACTIVE | CFP | W | 14 | 1 | Non-RoHS & Non-Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-9460206QD A TLE2074AMWB | Samp |
| TLE2071ACD | LIFEBUY | SOIC | D | 8 | 75 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 2071AC | |
| TLE2071ACDR | ACTIVE | SOIC | D | 8 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | | 2071AC | Samp |
| TLE2071ACP | ACTIVE | PDIP | Р | 8 | 50 | RoHS & Green | NIPDAU | N / A for Pkg Type | | TLE2071AC | Samj |
| TLE2071AID | LIFEBUY | SOIC | D | 8 | 75 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | 2071AI | |
| TLE2071AIDG4 | LIFEBUY | SOIC | D | 8 | 75 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | 2071AI | |
| TLE2071AIDR | ACTIVE | SOIC | D | 8 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | | 2071AI | Samp |
| TLE2071AIP | ACTIVE | PDIP | Р | 8 | 50 | RoHS & Green | NIPDAU | N / A for Pkg Type | | TLE2071AI | Samj |
| TLE2071AMFKB | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962 9460204Q2A TLE2071 AMFKB | Samp |
| TLE2071AMJG | ACTIVE | CDIP | JG | 8 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | TLE2071 AMJG | Samp |
| TLE2071AMJGB | ACTIVE | CDIP | JG | 8 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 9460204QPA TLE2071AM | Samp |
| TLE2071AMUB | ACTIVE | CFP | U | 10 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 9460204QHA TLE2071AM | Samp |
| TLE2071CD | LIFEBUY | SOIC | D | 8 | 75 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 2071C | |
| TLE2071CDG4 | LIFEBUY | SOIC | D | 8 | 75 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 2071C | |
| TLE2071CP | ACTIVE | PDIP | Р | 8 | 50 | RoHS & Green | NIPDAU | N / A for Pkg Type | | TLE2071CP | Samp |





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| Orderable Device | Status | Package Type | Package Drawing | Pins | Package Qty | Eco Plan | Lead finish/ Ball material | MSL Peak Temp | Op Temp (°C) | Device Marking (4/5) | Sample |
|------------------|---------|--------------|--------------------|------|----------------|---------------------|-------------------------------|--------------------|--------------|---|---------|
| TLE2071CPE4 | ACTIVE | PDIP | Р | 8 | 50 | TBD | Call TI | Call TI | | | Samples |
| TLE2071ID | LIFEBUY | SOIC | D | 8 | 75 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | 20711 | |
| TLE2071IDG4 | LIFEBUY | SOIC | D | 8 | 75 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | 20711 | |
| TLE2071IDR | ACTIVE | SOIC | D | 8 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | | 20711 | Samples |
| TLE2071IP | ACTIVE | PDIP | Р | 8 | 50 | RoHS & Green | NIPDAU | N / A for Pkg Type | | TLE2071IP | Samples |
| TLE2071MFKB | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962- 9460201Q2A TLE2071 MFKB | Samples |
| TLE2071MJG | ACTIVE | CDIP | JG | 8 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | TLE2071MJG | Samples |
| TLE2071MJGB | ACTIVE | CDIP | JG | 8 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 9460201QPA TLE2071M | Samples |
| TLE2072ACD | LIFEBUY | SOIC | D | 8 | 75 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 2072AC | |
| TLE2072ACP | ACTIVE | PDIP | Р | 8 | 50 | RoHS & Green | NIPDAU | N / A for Pkg Type | | TLE2072AC | Samples |
| TLE2072ACPE4 | ACTIVE | PDIP | Р | 8 | 50 | TBD | Call TI | Call TI | | | Samples |
| TLE2072AID | LIFEBUY | SOIC | D | 8 | 75 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | 2072AI | |
| TLE2072AIDG4 | LIFEBUY | SOIC | D | 8 | 75 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | 2072AI | |
| TLE2072AIDR | ACTIVE | SOIC | D | 8 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | | 2072AI | Samples |
| TLE2072AIP | ACTIVE | PDIP | Р | 8 | 50 | RoHS & Green | NIPDAU | N / A for Pkg Type | | TLE2072AI | Samples |
| TLE2072AMFKB | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962- 9460205Q2A TLE2072 AMFKB | Samples |
| TLE2072AMJG | ACTIVE | CDIP | JG | 8 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | TLE2072 AMJG | Samples |
| TLE2072AMJGB | ACTIVE | CDIP | JG | 8 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 9460205QPA TLE2072AM | Sample |
| TLE2072AMUB | ACTIVE | CFP | U | 10 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 9460205QHA TLE2072AM | Samples |





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| Orderable Device | Status | Package Type | Package Drawing | Pins | Package Qty | Eco Plan | Lead finish/ Ball material | MSL Peak Temp | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------|--------------|--------------------|------|----------------|---------------------|-------------------------------|--------------------|--------------|---|---------|
| TLE2072CD | LIFEBUY | SOIC | D | 8 | 75 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | | 2072C | |
| TLE2072CDR | ACTIVE | SOIC | D | 8 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | | 2072C | Samples |
| TLE2072CP | ACTIVE | PDIP | Р | 8 | 50 | RoHS & Green | NIPDAU | N / A for Pkg Type | | TLE2072CP | Samples |
| TLE2072ID | LIFEBUY | SOIC | D | 8 | 75 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | | 20721 | |
| TLE2072IDR | ACTIVE | SOIC | D | 8 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | 20721 | Samples |
| TLE2072IDRG4 | ACTIVE | SOIC | D | 8 | 2500 | TBD | Call TI | Call TI | -40 to 85 | | Samples |
| TLE2072IP | ACTIVE | PDIP | Р | 8 | 50 | RoHS & Green | NIPDAU | N / A for Pkg Type | | TLE2072IP | Samples |
| TLE2072MFKB | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962- 9460202Q2A TLE2072 MFKB | Samples |
| TLE2072MJG | ACTIVE | CDIP | JG | 8 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | TLE2072MJG | Samples |
| TLE2072MJGB | ACTIVE | CDIP | JG | 8 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 9460202QPA TLE2072M | Samples |
| TLE2072MUB | ACTIVE | CFP | U | 10 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 9460202QHA TLE2072M | Samples |
| TLE2074ACDW | ACTIVE | SOIC | DW | 16 | 40 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TLE2074AC | Samples |
| TLE2074ACN | ACTIVE | PDIP | N | 14 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | | TLE2074ACN | Samples |
| TLE2074ACNE4 | ACTIVE | PDIP | N | 14 | 25 | TBD | Call TI | Call TI | | | Samples |
| TLE2074AIDW | ACTIVE | SOIC | DW | 16 | 40 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | TLE2074AI | Samples |
| TLE2074AIN | ACTIVE | PDIP | N | 14 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | | TLE2074AIN | Samples |
| TLE2074AINE4 | ACTIVE | PDIP | N | 14 | 25 | TBD | Call TI | Call TI | | | Samples |
| TLE2074AMFKB | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962- 9460206Q2A TLE2074 AMFKB | Samples |



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| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material | MSL Peak Temp | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|------------|--------------|--------------------|------|----------------|-------------------------|-------------------------------|------------------------------|----------------------------|--|---------|
| TLE2074AMJ | ACTIVE | CDIP | J | 14 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | TLE2074AMJ | Samples |
| TLE2074AMJB | ACTIVE | CDIP | J | 14 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-9460206QC A TLE2074AMJB | Samples |
| TLE2074AMWB | ACTIVE | CFP | W | 14 | 1 | Non-RoHS & Non-Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-9460206QD A TLE2074AMWB | Samples |
| TLE2074CDW | ACTIVE | SOIC | DW | 16 | 40 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | Level-1-260C-UNLIM 0 to 70 | | Samples |
| TLE2074CDWR | ACTIVE | SOIC | DW | 16 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | | TLE2074C | Samples |
| TLE2074CN | ACTIVE | PDIP | N | 14 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | | TLE2074CN | Samples |
| TLE2074IDW | ACTIVE | SOIC | DW | 16 | 40 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM -40 to 85 | | TLE2074I | Samples |
| TLE2074IDWG4 | ACTIVE | SOIC | DW | 16 | 40 | TBD | Call TI | Call TI | -40 to 85 | | Samples |
| TLE2074IDWR | ACTIVE | SOIC | DW | 16 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | | TLE2074I | Samples |
| TLE2074IN | ACTIVE | PDIP | N | 14 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | | TLE2074IN | Samples |
| TLE2074MFKB | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962- 9460203Q2A TLE2074 MFKB | Samples |
| TLE2074MJ | ACTIVE | CDIP | J | 14 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | TLE2074MJ | Samples |
| TLE2074MJB | ACTIVE | CDIP | J | 14 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-9460203QC A TLE2074MJB | Samples |

(1) The marketing status values are defined as follows: **ACTIVE:** Product device recommended for new designs.

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

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

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

OBSOLETE: TI has discontinued the production of the device.

PACKAGE OPTION ADDENDUM

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(2) RoHS: TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

- (3) MSL, Peak Temp. The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.
- (4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.
- (5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.
- (6) Lead finish/Ball material Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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OTHER QUALIFIED VERSIONS OF TLE2071, TLE2071A, TLE2071AM, TLE2071M, TLE2072A, TLE2072AM, TLE2072AM, TLE2072AM, TLE2074AM, TLE2074AM, TLE2074M:

- Catalog: TLE2071A, TLE2071, TLE2072A, TLE2072, TLE2074A, TLE2074
- Automotive: TLE2071A-Q1, TLE2071A-Q1, TLE2072A-Q1, TLE2072A-Q1
- Military: TLE2071M, TLE2071AM, TLE2072M, TLE2072AM, TLE2074AM

NOTE: Qualified Version Definitions:

- Catalog TI's standard catalog product
- Automotive Q100 devices qualified for high-reliability automotive applications targeting zero defects

PACKAGE OPTION ADDENDUM

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• Military - QML certified for Military and Defense Applications



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TAPE AND REEL INFORMATION





| | Dimension designed to accommodate the component width |
|----|---|
| В0 | Dimension designed to accommodate the component length |
| K0 | Dimension designed to accommodate the component thickness |
| W | Overall width of the carrier tape |
| P1 | Pitch between successive cavity centers |

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

| Device | Package Type | Package Drawing | | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-------------|-----------------|--------------------|----|------|--------------------------|--------------------------|------------|------------|------------|------------|-----------|------------------|
| TLE2071ACDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TLE2071AIDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TLE2071IDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TLE2072AIDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TLE2072CDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TLE2072IDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TLE2072IDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TLE2074CDWR | SOIC | DW | 16 | 2000 | 330.0 | 16.4 | 10.75 | 10.7 | 2.7 | 12.0 | 16.0 | Q1 |
| TLE2074IDWR | SOIC | DW | 16 | 2000 | 330.0 | 16.4 | 10.75 | 10.7 | 2.7 | 12.0 | 16.0 | Q1 |



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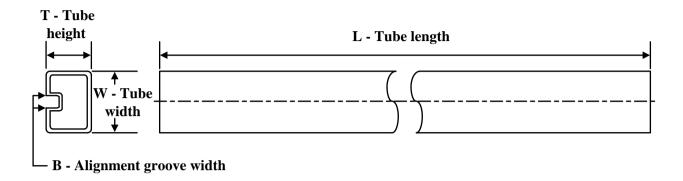
*All dimensions are nominal

| All difficultions are norminal | | | | | | | |
|--------------------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
| TLE2071ACDR | SOIC | D | 8 | 2500 | 340.5 | 336.1 | 25.0 |
| TLE2071AIDR | SOIC | D | 8 | 2500 | 340.5 | 336.1 | 25.0 |
| TLE2071IDR | SOIC | D | 8 | 2500 | 340.5 | 336.1 | 25.0 |
| TLE2072AIDR | SOIC | D | 8 | 2500 | 340.5 | 336.1 | 25.0 |
| TLE2072CDR | SOIC | D | 8 | 2500 | 340.5 | 336.1 | 25.0 |
| TLE2072IDR | SOIC | D | 8 | 2500 | 350.0 | 350.0 | 43.0 |
| TLE2072IDR | SOIC | D | 8 | 2500 | 340.5 | 336.1 | 25.0 |
| TLE2074CDWR | SOIC | DW | 16 | 2000 | 350.0 | 350.0 | 43.0 |
| TLE2074IDWR | SOIC | DW | 16 | 2000 | 350.0 | 350.0 | 43.0 |



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TUBE



*All dimensions are nominal

| Device | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (µm) | B (mm) |
|-----------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| 5962-9460201Q2A | FK | LCCC | 20 | 1 | 506.98 | 12.06 | 2030 | NA |
| 5962-9460202Q2A | FK | LCCC | 20 | 1 | 506.98 | 12.06 | 2030 | NA |
| 5962-9460202QHA | U | CFP | 10 | 1 | 506.98 | 26.16 | 6220 | NA |
| 5962-9460203Q2A | FK | LCCC | 20 | 1 | 506.98 | 12.06 | 2030 | NA |
| 5962-9460204Q2A | FK | LCCC | 20 | 1 | 506.98 | 12.06 | 2030 | NA |
| 5962-9460204QHA | U | CFP | 10 | 1 | 506.98 | 26.16 | 6220 | NA |
| 5962-9460205Q2A | FK | LCCC | 20 | 1 | 506.98 | 12.06 | 2030 | NA |
| 5962-9460205QHA | U | CFP | 10 | 1 | 506.98 | 26.16 | 6220 | NA |
| 5962-9460206Q2A | FK | LCCC | 20 | 1 | 506.98 | 12.06 | 2030 | NA |
| 5962-9460206QDA | W | CFP | 14 | 1 | 506.98 | 26.16 | 6220 | NA |
| TLE2071ACD | D | SOIC | 8 | 75 | 505.46 | 6.76 | 3810 | 4 |
| TLE2071ACD | D | SOIC | 8 | 75 | 507 | 8 | 3940 | 4.32 |
| TLE2071ACP | Р | PDIP | 8 | 50 | 506 | 13.97 | 11230 | 4.32 |
| TLE2071AID | D | SOIC | 8 | 75 | 505.46 | 6.76 | 3810 | 4 |
| TLE2071AID | D | SOIC | 8 | 75 | 507 | 8 | 3940 | 4.32 |
| TLE2071AIDG4 | D | SOIC | 8 | 75 | 505.46 | 6.76 | 3810 | 4 |
| TLE2071AIDG4 | D | SOIC | 8 | 75 | 507 | 8 | 3940 | 4.32 |
| TLE2071AIP | Р | PDIP | 8 | 50 | 506 | 13.97 | 11230 | 4.32 |
| TLE2071AMFKB | FK | LCCC | 20 | 1 | 506.98 | 12.06 | 2030 | NA |
| TLE2071AMUB | U | CFP | 10 | 1 | 506.98 | 26.16 | 6220 | NA |
| TLE2071CD | D | SOIC | 8 | 75 | 507 | 8 | 3940 | 4.32 |
| TLE2071CD | D | SOIC | 8 | 75 | 505.46 | 6.76 | 3810 | 4 |
| TLE2071CDG4 | D | SOIC | 8 | 75 | 507 | 8 | 3940 | 4.32 |
| TLE2071CDG4 | D | SOIC | 8 | 75 | 505.46 | 6.76 | 3810 | 4 |
| TLE2071CP | Р | PDIP | 8 | 50 | 506 | 13.97 | 11230 | 4.32 |
| TLE2071ID | D | SOIC | 8 | 75 | 507 | 8 | 3940 | 4.32 |
| TLE2071ID | D | SOIC | 8 | 75 | 505.46 | 6.76 | 3810 | 4 |
| TLE2071IDG4 | D | SOIC | 8 | 75 | 505.46 | 6.76 | 3810 | 4 |
| TLE2071IDG4 | D | SOIC | 8 | 75 | 507 | 8 | 3940 | 4.32 |



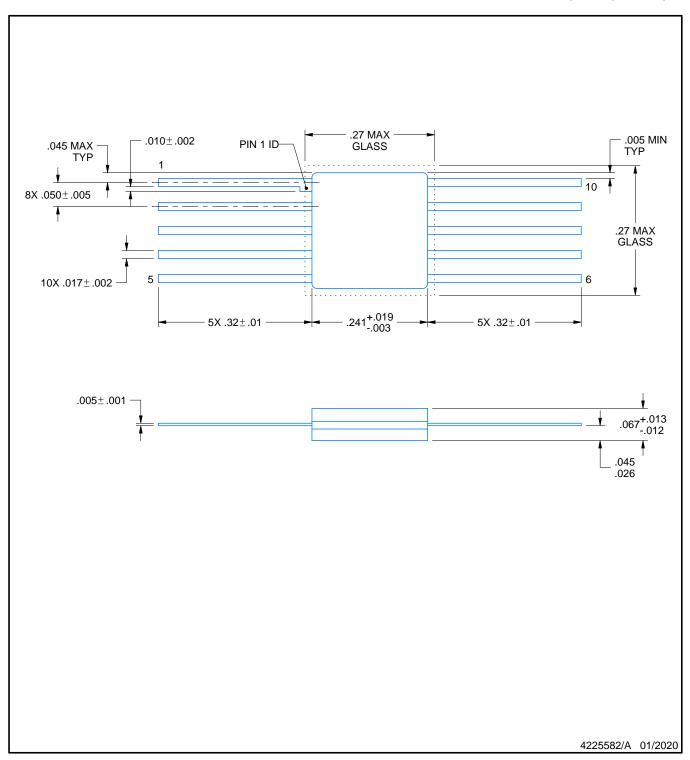
PACKAGE MATERIALS INFORMATION

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| Device | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (µm) | B (mm) |
|--------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| TLE2071IP | Р | PDIP | 8 | 50 | 506 | 13.97 | 11230 | 4.32 |
| TLE2071MFKB | FK | LCCC | 20 | 1 | 506.98 | 12.06 | 2030 | NA |
| TLE2072ACD | D | SOIC | 8 | 75 | 507 | 8 | 3940 | 4.32 |
| TLE2072ACD | D | SOIC | 8 | 75 | 505.46 | 6.76 | 3810 | 4 |
| TLE2072ACP | Р | PDIP | 8 | 50 | 506 | 13.97 | 11230 | 4.32 |
| TLE2072AID | D | SOIC | 8 | 75 | 506.6 | 8 | 3940 | 4.32 |
| TLE2072AID | D | SOIC | 8 | 75 | 505.46 | 6.76 | 3810 | 4 |
| TLE2072AID | D | SOIC | 8 | 75 | 507 | 8 | 3940 | 4.32 |
| TLE2072AIDG4 | D | SOIC | 8 | 75 | 506.6 | 8 | 3940 | 4.32 |
| TLE2072AIDG4 | D | SOIC | 8 | 75 | 507 | 8 | 3940 | 4.32 |
| TLE2072AIDG4 | D | SOIC | 8 | 75 | 505.46 | 6.76 | 3810 | 4 |
| TLE2072AIP | Р | PDIP | 8 | 50 | 506 | 13.97 | 11230 | 4.32 |
| TLE2072AMFKB | FK | LCCC | 20 | 1 | 506.98 | 12.06 | 2030 | NA |
| TLE2072AMUB | U | CFP | 10 | 1 | 506.98 | 26.16 | 6220 | NA |
| TLE2072CD | D | SOIC | 8 | 75 | 507 | 8 | 3940 | 4.32 |
| TLE2072CD | D | SOIC | 8 | 75 | 505.46 | 6.76 | 3810 | 4 |
| TLE2072CP | Р | PDIP | 8 | 50 | 506 | 13.97 | 11230 | 4.32 |
| TLE2072ID | D | SOIC | 8 | 75 | 505.46 | 6.76 | 3810 | 4 |
| TLE2072ID | D | SOIC | 8 | 75 | 507 | 8 | 3940 | 4.32 |
| TLE2072IP | Р | PDIP | 8 | 50 | 506 | 13.97 | 11230 | 4.32 |
| TLE2072MFKB | FK | LCCC | 20 | 1 | 506.98 | 12.06 | 2030 | NA |
| TLE2072MUB | U | CFP | 10 | 1 | 506.98 | 26.16 | 6220 | NA |
| TLE2074ACDW | DW | SOIC | 16 | 40 | 506.98 | 12.7 | 4826 | 6.6 |
| TLE2074ACN | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| TLE2074AIDW | DW | SOIC | 16 | 40 | 506.98 | 12.7 | 4826 | 6.6 |
| TLE2074AIN | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| TLE2074AMFKB | FK | LCCC | 20 | 1 | 506.98 | 12.06 | 2030 | NA |
| TLE2074AMWB | W | CFP | 14 | 1 | 506.98 | 26.16 | 6220 | NA |
| TLE2074CDW | DW | SOIC | 16 | 40 | 506.98 | 12.7 | 4826 | 6.6 |
| TLE2074CN | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| TLE2074IDW | DW | SOIC | 16 | 40 | 506.98 | 12.7 | 4826 | 6.6 |
| TLE2074IN | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| TLE2074MFKB | FK | LCCC | 20 | 1 | 506.98 | 12.06 | 2030 | NA |



CERAMIC FLATPACK



- 1. All linear dimensions are in inches. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
 2. This drawing is subject to change without notice.



W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



- 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.
- E. Falls within MIL STD 1835 GDFP1-F14



7.5 x 10.3, 1.27 mm pitch

SMALL OUTLINE INTEGRATED CIRCUIT

This image is a representation of the package family, actual package may vary. Refer to the product data sheet for package details.





SOIC



- 1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing
- per ASME Y14.5M.

 2. This drawing is subject to change without notice.

 3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
- 4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.
- 5. Reference JEDEC registration MS-013.



SOIC



NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SOIC



NOTES: (continued)

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



8.89 x 8.89, 1.27 mm pitch

LEADLESS CERAMIC CHIP CARRIER

This image is a representation of the package family, actual package may vary. Refer to the product data sheet for package details.



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CERAMIC DUAL IN LINE PACKAGE



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

4040083-5/G





CERAMIC DUAL IN LINE PACKAGE



- 1. All controlling linear dimensions are in inches. Dimensions in brackets are in millimeters. Any dimension in brackets or parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
- 2. This drawing is subject to change without notice.
- 3. This package is hermitically sealed with a ceramic lid using glass frit.
- His package is remitted by sealed with a ceramic its using glass mit.
 Index point is provided on cap for terminal identification only and on press ceramic glass frit seal only.
 Falls within MIL-STD-1835 and GDIP1-T14.



CERAMIC DUAL IN LINE PACKAGE





SMALL OUTLINE INTEGRATED CIRCUIT



- 1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. Dimensioning and tolerancing per ASME Y14.5M.
- 2. This drawing is subject to change without notice.
- 3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 [0.15] per side.
- 4. This dimension does not include interlead flash.
- 5. Reference JEDEC registration MS-012, variation AA.



SMALL OUTLINE INTEGRATED CIRCUIT



NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SMALL OUTLINE INTEGRATED CIRCUIT



NOTES: (continued)

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



JG (R-GDIP-T8)

CERAMIC DUAL-IN-LINE



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.
- E. Falls within MIL STD 1835 GDIP1-T8

P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE PACKAGE



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



N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



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



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