

- **1/2 V<sub>I</sub> Virtual Ground for Analog Systems**
- **Self-Contained 3-terminal TO-226AA Package**
- **Micropower Operation . . . 170 μA Typ, V<sub>I</sub> = 5 V**
- **Wide V<sub>I</sub> Range . . . 4 V to 40 V**
- **High Output-Current Capability**
  - Source . . . 20 mA Typ
  - Sink . . . 20 mA Typ

- **Excellent Output Regulation**
  - –45 μV Typ at I<sub>O</sub> = 0 to –10 mA
  - +15 μV Typ at I<sub>O</sub> = 0 to +10 mA
- **Low-Impedance Output . . . 0.0075 Ω Typ**
- **Noise Reduction Pin (D, JG, and P Packages Only)**

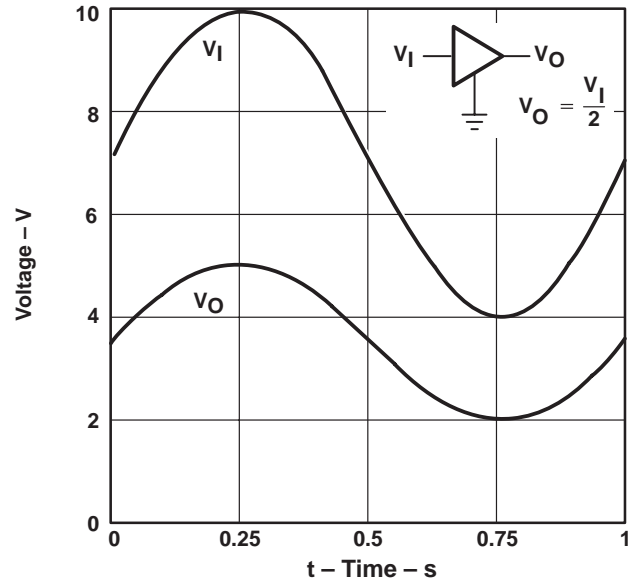
**description**

In signal-conditioning applications utilizing a single power source, a reference voltage equal to one-half the supply voltage is required for termination of all analog signal grounds. Texas Instruments presents a precision virtual ground whose output voltage is always equal to one-half the input voltage, the TLE2426 "rail splitter."

The unique combination of a high-performance, micropower operational amplifier and a precision-trimmed divider on a single silicon chip results in a precise V<sub>O</sub>/V<sub>I</sub> ratio of 0.5 while sinking and sourcing current. The TLE2426 provides a low-impedance output with 20 mA of sink and source capability while drawing less than 280 μA of supply current over the full input range of 4 V to 40 V. A designer need not pay the price in terms of board space for a conventional signal ground consisting of resistors, capacitors, operational amplifiers, and voltage references. The performance and precision of the TLE2426 is available in an easy-to-use, space saving, 3-terminal LP package. For increased performance, the optional 8-pin packages provide a noise-reduction pin. With the addition of an external capacitor (C<sub>NR</sub>), peak-to-peak noise is reduced while line ripple rejection is improved.

Initial output tolerance for a single 5-V or 12-V system is better than 1% with 3.6% over the full 40-V input range. Ripple rejection exceeds 12 bits of accuracy. Whether the application is for a data acquisition front end, analog signal termination, or simply a precision voltage reference, the TLE2426 eliminates a major source of system error.

**INPUT/OUTPUT TRANSFER CHARACTERISTICS**



**AVAILABLE OPTIONS**

| PACKAGED DEVICES |                   |                  |              |                 | CHIP FORM (Y) |
|------------------|-------------------|------------------|--------------|-----------------|---------------|
| T <sub>A</sub>   | SMALL OUTLINE (D) | CERAMIC DIP (JG) | PLASTIC (LP) | PLASTIC DIP (P) |               |
| 0°C to 70°C      | TLE2426CD         | —                | TLE2426CLP   | TLE2426CP       | TLE2426Y      |
| –40°C to 85°C    | TLE2426ID         | —                | TLE2426ILP   | TLE2426IP       |               |
| –55°C to 125°C   | TLE2426MD         | TLE2426MJG       | TLE2426MLP   | TLE2426MP       |               |

The D and LP packages are available taped and reeled in the commercial temperature range only. Add R suffix to the device type (e. g., TLC2426CDR). Chips are tested at 25°C.



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.

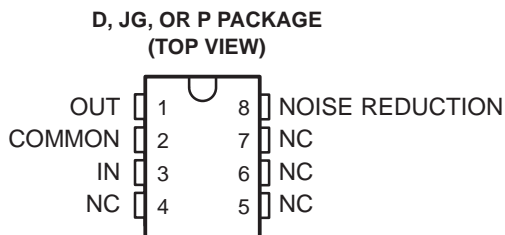
PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

# TLE2426, TLE2426Y THE "RAIL SPLITTER" PRECISION VIRTUAL GROUND

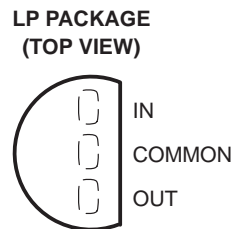
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## description (continued)

The C-suffix devices are characterized for operation from 0°C to 70°C. The I suffix devices are characterized for operation from -40°C to 85°C. The M suffix devices are characterized over the full military temperature range of -55°C to 125°C.

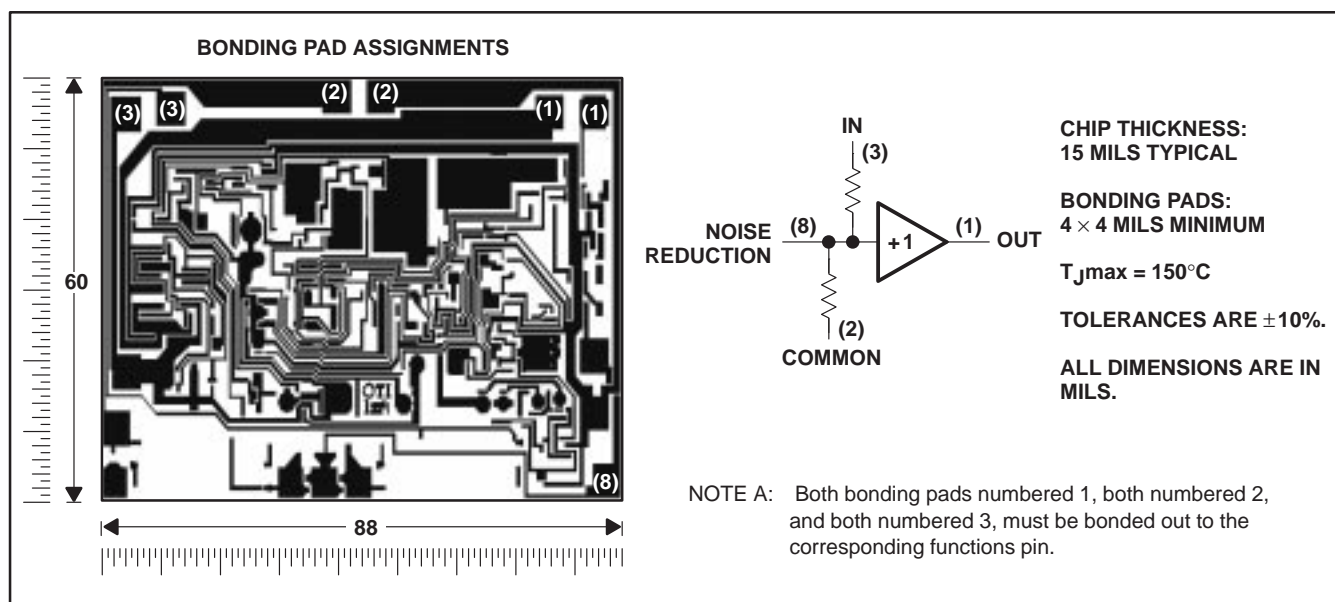


NC – No internal connection



## TLE2426Y chip information

This chip, properly assembled, displays characteristics similar to the TLE2426C. Thermal compression or ultrasonic bonding may be used on the doped aluminum bonding pads. The chips may be mounted with conductive epoxy or a gold-silicon preform.



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

|  |                              |
|--|------------------------------|
| Continuous input voltage, $V_I$ .....  | 40 V                         |
| Continuous filter trap voltage .....   | 40 V                         |
| Output current, $I_O$ .....  | $\pm 80$ mA                  |
| Duration of short-circuit current at (or below) 25°C (see Note 1) .....              | unlimited                    |
| Continuous total power dissipation .....   | See Dissipation Rating Table |
| Operating free-air temperature range, $T_A$ : C suffix .....                         | 0°C to 70°C                  |
| I suffix .....   | -40°C to 85°C                |
| M suffix .....   | -55°C to 125°C               |
| Storage temperature range, $T_{stg}$ .....   | -65°C to 150°C               |
| Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D or P package .....   | 260°C                        |
| Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: JG or LP 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.

NOTE 1: The output may be shorted to either supply. Temperature and/or supply voltages must be limited to ensure that the maximum dissipation rating is not exceeded.

**DISSIPATION RATING TABLE**

| PACKAGE | $T_A \leq 25^\circ\text{C}$ | DERATING FACTOR                | $T_A = 70^\circ\text{C}$ | $T_A = 85^\circ\text{C}$ | $T_A = 125^\circ\text{C}$ |
|---------|-----------------------------|--------------------------------|--------------------------|--------------------------|---------------------------|
|         | POWER RATING                | ABOVE $T_A = 25^\circ\text{C}$ | POWER RATING             | POWER RATING             | POWER RATING              |
| D       | 725 mV                      | 5.8 mW/°C                      | 464 mW                   | 377 mW                   | 145 mW                    |
| JG      | 1050 mV                     | 8.4 mW/°C                      | 672 mW                   | 546 mW                   | 210 mW                    |
| LP      | 775 mV                      | 6.2 mW/°C                      | 496 mW                   | 403 mW                   | 155 mW                    |
| P       | 1000 mV                     | 8.0 mW/°C                      | 640 mW                   | 520 mW                   | 200 mW                    |

**recommended operating conditions**

|                                       | C SUFFIX |     | I SUFFIX |     | M SUFFIX |     | UNIT |
|---------------------------------------|----------|-----|----------|-----|----------|-----|------|
|                                       | MIN      | MAX | MIN      | MAX | MIN      | MAX |      |
| Input voltage, $V_I$                  | 4        | 40  | 4        | 40  | 4        | 40  | V    |
| Operating free-air temperature, $T_A$ | 0        | 70  | -40      | 85  | -55      | 125 | °C   |

**TLE2426, TLE2426Y**  
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**electrical characteristics at specified free-air temperature,  $V_I = 5\text{ V}$ ,  $I_O = 0$  (unless otherwise noted)**

| PARAMETER                                     | TEST CONDITIONS   |                                 | $T_A$ †    | TLE2426C |      |        | UNIT |
|---|---|---------------------------------|------------|----------|------|--------|------|
|   |   |                                 |            | MIN      | TYP  | MAX    |      |
| Output voltage                                | $V_I = 4\text{ V}$                                      |                                 | 25°C       | 1.98     | 2    | 2.02   | V    |
|   | $V_I = 5\text{ V}$                                      |                                 |            | 2.48     | 2.5  | 2.52   |      |
|   | $V_I = 40\text{ V}$                                     |                                 |            | 19.8     | 20   | 20.2   |      |
|   | $V_I = 5\text{ V}$                                      |                                 | Full range | 2.475    |      | 2.525  |      |
| Temperature coefficient of output voltage     |   |                                 | Full range | 25       |      | ppm/°C |      |
| Supply current                                | No load   | $V_I = 5\text{ V}$              | 25°C       | 170      | 300  | μA     |      |
|   |   | $V_I = 4\text{ to }40\text{ V}$ | Full range | 400      |      |        |      |
| Output voltage regulation (sourcing current)‡ | $I_O = 0\text{ to }-10\text{ mA}$                       |                                 | 25°C       | -45      | ±160 | μV     |      |
|   |   |                                 | Full range | ±250     |      |        |      |
| Output voltage regulation (sinking current)‡  | $I_O = 0\text{ to }-20\text{ mA}$                       |                                 | 25°C       | -150     | ±450 | μV     |      |
|   |   |                                 | Full range | ±250     |      |        |      |
| Output voltage regulation (sinking current)‡  | $I_O = 0\text{ to }10\text{ mA}$                        |                                 | 25°C       | 15       | ±160 | μV     |      |
|   |   |                                 | Full range | ±250     |      |        |      |
| Output voltage regulation (sinking current)‡  | $I_O = 0\text{ to }20\text{ mA}$                        |                                 | 25°C       | 65       | ±235 | μV     |      |
|   |   |                                 | Full range | ±235     |      |        |      |
| Output impedance                              |   |                                 | 25°C       | 7.5      | 22.5 | mΩ     |      |
| Noise-reduction impedance                     |   |                                 | 25°C       | 110      |      | kΩ     |      |
| Short-circuit current                         | Sinking current, $V_O = 5\text{ V}$                     |                                 | 25°C       | 26       |      | mA     |      |
|   | Sourcing current, $V_O = 0$                             |                                 |            | -47      |      |        |      |
| Output noise voltage, rms                     | $f = 10\text{ Hz to }10\text{ kHz}$                     | $C_{NR} = 0$                    | 25°C       | 120      |      | μV     |      |
|   |   | $C_{NR} = 1\text{ μF}$          |            | 30       |      |        |      |
| Output voltage current step response          | $V_O\text{ to }0.1\%$ , $I_O = \pm 10\text{ mA}$        | $C_L = 0$                       | 25°C       | 290      |      | μs     |      |
|   |   | $C_L = 100\text{ pF}$           |            | 275      |      |        |      |
|   | $V_O\text{ to }0.01\%$ , $I_O = \pm 10\text{ mA}$       | $C_L = 0$                       | 25°C       | 400      |      |        |      |
|   |   | $C_L = 100\text{ pF}$           |            | 390      |      |        |      |
| Step response                                 | $V_I = 0\text{ to }5\text{ V}$ , $V_O\text{ to }0.1\%$  |                                 | 25°C       | 20       |      | μs     |      |
|   | $V_I = 0\text{ to }5\text{ V}$ , $V_O\text{ to }0.01\%$ |                                 |            | 160      |      |        |      |

† Full range is 0°C to 70°C.

‡ The listed values are not production tested.



**electrical characteristics at specified free-air temperature,  $V_I = 12\text{ V}$ ,  $I_O = 0$  (unless otherwise noted)**

| PARAMETER                                      | TEST CONDITIONS                                       |                                 | $T_A$ †    | TLE2426C |      |        | UNIT |
|--|---|---------------------------------|------------|----------|------|--------|------|
|  |   |                                 |            | MIN      | TYP  | MAX    |      |
| Output voltage                                 | $V_I = 4\text{ V}$                                    |                                 | 25°C       | 1.98     | 2    | 2.02   | V    |
|  | $V_I = 12\text{ V}$                                   |                                 |            | 5.95     | 6    | 6.05   |      |
|  | $V_I = 40\text{ V}$                                   |                                 |            | 19.8     | 20   | 20.2   |      |
|  | $V_I = 12\text{ V}$                                   |                                 | Full range | 5.945    |      | 6.055  |      |
| Temperature coefficient of output voltage      |   |                                 | Full range | 35       |      | ppm/°C |      |
| Supply current                                 | No load   | $V_I = 12\text{ V}$             | 25°C       | 195      | 300  | μA     |      |
|  |   | $V_I = 4\text{ to }40\text{ V}$ | Full range | 400      |      |        |      |
| Output voltage regulation (sourcing current) ‡ | $I_O = 0\text{ to }-10\text{ mA}$                     |                                 | 25°C       | -45      | ±160 | μV     |      |
|  |   |                                 | Full range | ±250     |      |        |      |
| Output voltage regulation (sinking current) ‡  | $I_O = 0\text{ to }-20\text{ mA}$                     |                                 | 25°C       | -150     | ±450 | μV     |      |
|  |   |                                 | Full range | ±250     |      |        |      |
| Output voltage regulation (sinking current) ‡  | $I_O = 0\text{ to }10\text{ mA}$                      |                                 | 25°C       | 15       | ±160 | μV     |      |
|  |   |                                 | Full range | ±250     |      |        |      |
| Output impedance                               |   |                                 | 25°C       | 7.5      | 22.5 | mΩ     |      |
| Noise-reduction impedance                      |   |                                 | 25°C       | 110      |      | kΩ     |      |
| Short-circuit current                          | Sinking current,                                      | $V_O = 12\text{ V}$             | 25°C       | 31       |      | mA     |      |
|  | Sourcing current,                                     | $V_O = 0$                       |            | -70      |      |        |      |
| Output noise voltage, rms                      | $f = 10\text{ Hz to }10\text{ kHz}$                   | $C_{NR} = 0$                    | 25°C       | 120      |      | μV     |      |
|  |   | $C_{NR} = 1\text{ μF}$          |            | 30       |      |        |      |
| Output voltage current step response           | $V_O\text{ to }0.1\%, I_O = \pm 10\text{ mA}$         | $C_L = 0$                       | 25°C       | 290      |      | μs     |      |
|  |   | $C_L = 100\text{ pF}$           |            | 275      |      |        |      |
|  | $V_O\text{ to }0.01\%, I_O = \pm 10\text{ mA}$        | $C_L = 0$                       | 25°C       | 400      |      |        |      |
|  |   | $C_L = 100\text{ pF}$           |            | 390      |      |        |      |
| Step response                                  | $V_I = 0\text{ to }12\text{ V}, V_O\text{ to }0.1\%$  |                                 | 25°C       | 20       |      | μs     |      |
|  | $V_I = 0\text{ to }12\text{ V}, V_O\text{ to }0.01\%$ |                                 |            | 120      |      |        |      |

† Full range is 0°C to 70°C.

‡ The listed values are not production tested.

**TLE2426, TLE2426Y**  
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**electrical characteristics at specified free-air temperature,  $V_I = 5\text{ V}$ ,  $I_O = 0$  (unless otherwise noted)**

| PARAMETER                                     | TEST CONDITIONS   |                                 | $T_A$ †    | TLE2426I  |      |        | UNIT |
|---|---|---------------------------------|------------|-----------|------|--------|------|
|   |   |                                 |            | MIN       | TYP  | MAX    |      |
| Output voltage                                | $V_I = 4\text{ V}$                                      |                                 | 25°C       | 1.98      | 2    | 2.02   | V    |
|   | $V_I = 5\text{ V}$                                      |                                 |            | 2.48      | 2.5  | 2.52   |      |
|   | $V_I = 40\text{ V}$                                     |                                 |            | 19.8      | 20   | 20.2   |      |
|   | $V_I = 5\text{ V}$                                      |                                 | Full range | 2.47 2.53 |      |        |      |
| Temperature coefficient of output voltage     |   |                                 | Full range | 25        |      | ppm/°C |      |
| Supply current                                | No load   | $V_I = 5\text{ V}$              | 25°C       | 170       | 300  | μA     |      |
|   |   | $V_I = 4\text{ to }40\text{ V}$ | Full range | 400       |      |        |      |
| Output voltage regulation (sourcing current)‡ | $I_O = 0\text{ to }-10\text{ mA}$                       |                                 | 25°C       | -45       | ±160 | μV     |      |
|   |   |                                 | Full range | ±250      |      |        |      |
| Output voltage regulation (sinking current)‡  | $I_O = 0\text{ to }-20\text{ mA}$                       |                                 | 25°C       | -150      | ±450 | μV     |      |
|   |   |                                 | Full range | ±250      |      |        |      |
| Output voltage regulation (sinking current)‡  | $I_O = 0\text{ to }10\text{ mA}$                        |                                 | 25°C       | 15        | ±160 | μV     |      |
|   | $I_O = 0\text{ to }8\text{ mA}$                         |                                 | Full range | ±250      |      |        |      |
|   | $I_O = 0\text{ to }20\text{ mA}$                        |                                 | 25°C       | 65        | ±235 |        |      |
| Output impedance                              |   |                                 | 25°C       | 7.5       | 22.5 | mΩ     |      |
| Noise-reduction impedance                     |   |                                 | 25°C       | 110       |      | kΩ     |      |
| Short-circuit current                         | Sinking current, $V_O = 5\text{ V}$                     |                                 | 25°C       | 26        |      | mA     |      |
|   | Sourcing current, $V_O = 0$                             |                                 |            | -47       |      |        |      |
| Output noise voltage, rms                     | $f = 10\text{ Hz to }10\text{ kHz}$                     | $C_{NR} = 0$                    | 25°C       | 120       |      | μV     |      |
|   |   | $C_{NR} = 1\text{ μF}$          |            | 30        |      |        |      |
| Output voltage current step response          | $V_O\text{ to }0.1\%$ , $I_O = \pm 10\text{ mA}$        | $C_L = 0$                       | 25°C       | 290       |      | μs     |      |
|   |   | $C_L = 100\text{ pF}$           |            | 275       |      |        |      |
|   | $V_O\text{ to }0.01\%$ , $I_O = \pm 10\text{ mA}$       | $C_L = 0$                       | 25°C       | 400       |      |        |      |
|   |   | $C_L = 100\text{ pF}$           |            | 390       |      |        |      |
| Step response                                 | $V_I = 0\text{ to }5\text{ V}$ , $V_O\text{ to }0.1\%$  |                                 | 25°C       | 20        |      | μs     |      |
|   | $V_I = 0\text{ to }5\text{ V}$ , $V_O\text{ to }0.01\%$ |                                 |            | 160       |      |        |      |

† Full range is -40°C to 85°C.

‡ The listed values are not production tested.



**electrical characteristics at specified free-air temperature,  $V_I = 12\text{ V}$ ,  $I_O = 0$  (unless otherwise noted)**

| PARAMETER                                     | TEST CONDITIONS  |                                 | $T_A$ †    | TLE2426I |      |        | UNIT |
|---|--|---------------------------------|------------|----------|------|--------|------|
|   |  |                                 |            | MIN      | TYP  | MAX    |      |
| Output voltage                                | $V_I = 4\text{ V}$                                       |                                 | 25°C       | 1.98     | 2    | 2.02   | V    |
|   | $V_I = 12\text{ V}$                                      |                                 |            | 5.95     | 6    | 6.05   |      |
|   | $V_I = 40\text{ V}$                                      |                                 |            | 19.8     | 20   | 20.2   |      |
|   | $V_I = 12\text{ V}$                                      |                                 | Full range | 5.935    |      | 6.065  |      |
| Temperature coefficient of output voltage     |  |                                 | Full range | 35       |      | ppm/°C |      |
| Supply current                                | No load  | $V_I = 12\text{ V}$             | 25°C       | 195      | 300  | μA     |      |
|   |  | $V_I = 4\text{ to }40\text{ V}$ | Full range | 400      |      |        |      |
| Output voltage regulation (sourcing current)‡ | $I_O = 0\text{ to }-10\text{ mA}$                        |                                 | 25°C       | -45      | ±160 | μV     |      |
|   |  |                                 | Full range | ±250     |      |        |      |
| Output voltage regulation (sinking current)‡  | $I_O = 0\text{ to }-20\text{ mA}$                        |                                 | 25°C       | -150     | ±450 | μV     |      |
|   | $I_O = 0\text{ to }10\text{ mA}$                         |                                 | 25°C       | 15       | ±160 |        |      |
|   | $I_O = 0\text{ to }8\text{ mA}$                          |                                 | Full range | ±250     |      |        |      |
| Output voltage regulation (sinking current)‡  | $I_O = 0\text{ to }20\text{ mA}$                         |                                 | 25°C       | 65       | ±235 | μV     |      |
|   |  |                                 |            |          |      |        |      |
| Output impedance                              |  |                                 | 25°C       | 7.5      | 22.5 | mΩ     |      |
| Noise-reduction impedance                     |  |                                 | 25°C       | 110      |      | kΩ     |      |
| Short-circuit current                         | Sinking current, $V_O = 12\text{ V}$                     |                                 | 25°C       | 31       |      | mA     |      |
|   | Sourcing current, $V_O = 0$                              |                                 |            | -70      |      |        |      |
| Output noise voltage, rms                     | $f = 10\text{ Hz to }10\text{ kHz}$                      | $C_{NR} = 0$                    | 25°C       | 120      |      | μV     |      |
|   |  | $C_{NR} = 1\text{ μF}$          |            | 30       |      |        |      |
| Output voltage current step response          | $V_O\text{ to }0.1\%$ , $I_O = \pm 10\text{ mA}$         | $C_L = 0$                       | 25°C       | 290      |      | μs     |      |
|   |  | $C_L = 100\text{ pF}$           |            | 275      |      |        |      |
|   | $V_O\text{ to }0.01\%$ , $I_O = \pm 10\text{ mA}$        | $C_L = 0$                       | 25°C       | 400      |      |        |      |
|   |  | $C_L = 100\text{ pF}$           |            | 390      |      |        |      |
| Step response                                 | $V_I = 0\text{ to }12\text{ V}$ , $V_O\text{ to }0.1\%$  |                                 | 25°C       | 20       |      | μs     |      |
|   | $V_I = 0\text{ to }12\text{ V}$ , $V_O\text{ to }0.01\%$ |                                 |            | 120      |      |        |      |

† Full range is -40°C to 85°C.

‡ The listed values are not production tested.

**TLE2426, TLE2426Y**  
**THE "RAIL SPLITTER"**  
**PRECISION VIRTUAL GROUND**

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**electrical characteristics at specified free-air temperature,  $V_I = 5\text{ V}$ ,  $I_O = 0$  (unless otherwise noted)**

| PARAMETER                                     | TEST CONDITIONS   |                                 | $T_A$ †    | TLE2426M |      |        | UNIT |
|---|---|---------------------------------|------------|----------|------|--------|------|
|   |   |                                 |            | MIN      | TYP  | MAX    |      |
| Output voltage                                | $V_I = 4\text{ V}$                                      |                                 | 25°C       | 1.98     | 2    | 2.02   | V    |
|   | $V_I = 5\text{ V}$                                      |                                 |            | 2.48     | 2.5  | 2.52   |      |
|   | $V_I = 40\text{ V}$                                     |                                 |            | 19.8     | 20   | 20.2   |      |
|   | $V_I = 5\text{ V}$                                      |                                 | Full range | 2.465    |      | 2.535  |      |
| Temperature coefficient of output voltage     |   |                                 | Full range | 25       |      | ppm/°C |      |
| Supply current                                | No load   | $V_I = 5\text{ V}$              | 25°C       | 170      | 300  | µA     |      |
|   |   | $V_I = 4\text{ to }40\text{ V}$ | Full range | 400      |      |        |      |
| Output voltage regulation (sourcing current)‡ | $I_O = 0\text{ to }-10\text{ mA}$                       |                                 | 25°C       | -45      | ±160 | µV     |      |
|   |   |                                 | Full range | ±250     |      |        |      |
| Output voltage regulation (sinking current)‡  | $I_O = 0\text{ to }-20\text{ mA}$                       |                                 | 25°C       | -150     | ±450 | µV     |      |
|   | $I_O = 0\text{ to }10\text{ mA}$                        |                                 | 25°C       | 15       | ±160 |        |      |
|   | $I_O = 0\text{ to }3\text{ mA}$                         |                                 | Full range | ±250     |      |        |      |
| Output voltage regulation (sinking current)‡  | $I_O = 0\text{ to }20\text{ mA}$                        |                                 | 25°C       | 65       | ±235 | µV     |      |
|   |   |                                 |            |          |      |        |      |
| Output impedance                              |   |                                 | 25°C       | 7.5      | 22.5 | mΩ     |      |
| Noise-reduction impedance                     |   |                                 | 25°C       | 110      |      | kΩ     |      |
| Short-circuit current                         | Sinking current,  | $V_O = 5\text{ V}$              | 25°C       | 26       |      | mA     |      |
|   | Sourcing current,                                       | $V_O = 0$                       |            | -47      |      |        |      |
| Output noise voltage, rms                     | $f = 10\text{ Hz to }10\text{ kHz}$                     | $C_{NR} = 0$                    | 25°C       | 120      |      | µV     |      |
|   |   | $C_{NR} = 1\text{ µF}$          |            | 30       |      |        |      |
| Output voltage current step response          | $V_O\text{ to }0.1\%$ , $I_O = \pm 10\text{ mA}$        | $C_L = 0$                       | 25°C       | 290      |      | µs     |      |
|   |   | $C_L = 100\text{ pF}$           |            | 275      |      |        |      |
|   | $V_O\text{ to }0.01\%$ , $I_O = \pm 10\text{ mA}$       | $C_L = 0$                       | 25°C       | 400      |      |        |      |
|   |   | $C_L = 100\text{ pF}$           |            | 390      |      |        |      |
| Step response                                 | $V_I = 0\text{ to }5\text{ V}$ , $V_O\text{ to }0.1\%$  |                                 | 25°C       | 20       |      | µs     |      |
|   | $V_I = 0\text{ to }5\text{ V}$ , $V_O\text{ to }0.01\%$ |                                 |            | 120      |      |        |      |

† Full range is -55°C to 125°C.

‡ The listed values are not production tested.





**electrical characteristics at specified free-air temperature,  $V_I = 12\text{ V}$ ,  $I_O = 0$  (unless otherwise noted)**

| PARAMETER                                     | TEST CONDITIONS  |                                 | $T_A$ †    | TLE2426M |      |        | UNIT |
|---|--|---------------------------------|------------|----------|------|--------|------|
|   |  |                                 |            | MIN      | TYP  | MAX    |      |
| Output voltage                                | $V_I = 4\text{ V}$                                       |                                 | 25°C       | 1.98     | 2    | 2.02   | V    |
|   | $V_I = 12\text{ V}$                                      |                                 |            | 5.95     | 6    | 6.05   |      |
|   | $V_I = 40\text{ V}$                                      |                                 |            | 19.8     | 20   | 20.2   |      |
|   | $V_I = 12\text{ V}$                                      |                                 | Full range | 5.925    |      | 6.075  |      |
| Temperature coefficient of output voltage     |  |                                 | Full range | 35       |      | ppm/°C |      |
| Supply current                                | No load  | $V_I = 12\text{ V}$             | 25°C       | 195      | 250  | µA     |      |
|   |  | $V_I = 4\text{ to }40\text{ V}$ | Full range | 350      |      |        |      |
| Output voltage regulation (sourcing current)‡ | $I_O = 0\text{ to }-10\text{ mA}$                        |                                 | 25°C       | -45      | ±160 | µV     |      |
|   |  |                                 | Full range | ±250     |      |        |      |
|   | $I_O = 0\text{ to }-20\text{ mA}$                        |                                 | 25°C       | -150     | ±450 |        |      |
| Output voltage regulation (sinking current)‡  | $I_O = 0\text{ to }10\text{ mA}$                         |                                 | 25°C       | 15       | ±160 | µV     |      |
|   | $I_O = 0\text{ to }8\text{ mA}$                          |                                 | Full range | ±250     |      |        |      |
|   | $I_O = 0\text{ to }20\text{ mA}$                         |                                 | 25°C       | 65       | ±235 |        |      |
| Output impedance                              |  |                                 | 25°C       | 7.5      | 22.5 | mΩ     |      |
| Noise-reduction impedance                     |  |                                 | 25°C       | 110      |      | kΩ     |      |
| Short-circuit current                         | Sinking current, $V_O = 12\text{ V}$                     |                                 | 25°C       | 31       |      | mA     |      |
|   | Sourcing current, $V_O = 0$                              |                                 |            | -70      |      |        |      |
| Output noise voltage, rms                     | $f = 10\text{ Hz to }10\text{ kHz}$                      | $C_{NR} = 0$                    | 25°C       | 120      |      | µV     |      |
|   |  | $C_{NR} = 1\text{ µF}$          |            | 30       |      |        |      |
| Output voltage current step response          | $V_O\text{ to }0.1\%$ , $I_O = \pm 10\text{ mA}$         | $C_L = 0$                       | 25°C       | 290      |      | µs     |      |
|   |  | $C_L = 100\text{ pF}$           |            | 275      |      |        |      |
|   | $V_O\text{ to }0.01\%$ , $I_O = \pm 10\text{ mA}$        | $C_L = 0$                       | 25°C       | 400      |      |        |      |
|   |  | $C_L = 100\text{ pF}$           |            | 390      |      |        |      |
| Step response                                 | $V_I = 0\text{ to }12\text{ V}$ , $V_O\text{ to }0.1\%$  |                                 | 25°C       | 12       |      | µs     |      |
|   | $V_I = 0\text{ to }12\text{ V}$ , $V_O\text{ to }0.01\%$ |                                 |            | 120      |      |        |      |

† Full range is -55°C to 125°C.

‡ The listed values are not production tested.

**TLE2426, TLE2426Y**  
**THE "RAIL SPLITTER"**  
**PRECISION VIRTUAL GROUND**  
 SLOS098D – AUGUST 1991 – REVISED MAY 1998

**electrical characteristics at specified free-air temperature,  $V_I = 5\text{ V}$ ,  $I_O = 0$ ,  $T_A = 25^\circ\text{C}$  (unless otherwise noted)**

| PARAMETER                                     | TEST CONDITIONS                            | TLE2426Y                  |     |     | UNIT             |
|---|--|---------------------------|-----|-----|------------------|
|   |  | MIN                       | TYP | MAX |                  |
| Output voltage                                | $V_I = 5\text{ V}$                         | 2.5                       |     |     | V                |
| Supply current                                | No load                                    | 170                       |     |     | $\mu\text{A}$    |
| Output voltage regulation (sourcing current)† | $I_O = 0$ to $-10\text{ mA}$               | -45                       |     |     | $\mu\text{V}$    |
|   | $I_O = 0$ to $-20\text{ mA}$               | -150                      |     |     |                  |
| Output voltage regulation (sinking current)†  | $I_O = 0$ to $10\text{ mA}$                | 15                        |     |     | $\mu\text{V}$    |
|   | $I_O = 0$ to $20\text{ mA}$                | 65                        |     |     |                  |
| Output impedance                              |  | 7.5                       |     |     | $\text{m}\Omega$ |
| Noise-reduction impedance                     |  | 110                       |     |     | $\text{k}\Omega$ |
| Short-circuit current                         | Sinking current, $V_O = 5\text{ V}$        | 26                        |     |     | mA               |
|   | Sourcing current, $V_O = 0$                | -47                       |     |     |                  |
| Output noise voltage, rms                     | $f = 10\text{ Hz}$ to $10\text{ kHz}$      | $C_{NR} = 0$              | 120 |     | $\mu\text{V}$    |
|   |  | $C_{NR} = 1\ \mu\text{F}$ | 30  |     |                  |
| Output voltage current step response          | $V_O$ to 0.1%, $I_O = \pm 10\text{ mA}$    | $C_L = 0$                 | 290 |     | $\mu\text{s}$    |
|   |  | $C_L = 100\text{ pF}$     | 275 |     |                  |
|   | $V_O$ to 0.01%, $I_O = \pm 10\text{ mA}$   | $C_L = 0$                 | 400 |     |                  |
|   |  | $C_L = 100\text{ pF}$     | 390 |     |                  |
| Step response                                 | $V_I = 0$ to $5\text{ V}$ , $V_O$ to 0.1%  | $C_L = 100\text{ pF}$     | 20  |     | $\mu\text{s}$    |
|   | $V_I = 0$ to $5\text{ V}$ , $V_O$ to 0.01% |                           | 160 |     |                  |

† The listed values are not production tested.

**electrical characteristics at specified free-air temperature,  $V_I = 12\text{ V}$ ,  $I_O = 0$ ,  $T_A = 25^\circ\text{C}$  (unless otherwise noted)**

| PARAMETER                                     | TEST CONDITIONS                             | TLE2426Y                  |     |     | UNIT             |
|---|---|---------------------------|-----|-----|------------------|
|   |   | MIN                       | TYP | MAX |                  |
| Output voltage                                | $V_I = 12\text{ V}$                         | 6                         |     |     | V                |
| Supply current                                | No load                                     | 195                       |     |     | $\mu\text{A}$    |
| Output voltage regulation (sourcing current)† | $I_O = 0$ to $-10\text{ mA}$                | -45                       |     |     | $\mu\text{V}$    |
|   | $I_O = 0$ to $-20\text{ mA}$                | -150                      |     |     |                  |
| Output voltage regulation (sinking current)†  | $I_O = 0$ to $3\text{ mA}$                  | 15                        |     |     | $\mu\text{V}$    |
|   | $I_O = 0$ to $20\text{ mA}$                 | 65                        |     |     |                  |
| Output impedance                              |   | 7.5                       |     |     | $\text{m}\Omega$ |
| Noise-reduction impedance                     |   | 110                       |     |     | $\text{k}\Omega$ |
| Short-circuit current                         | Sinking current, $V_O = 12\text{ V}$        | 31                        |     |     | mA               |
|   | Sourcing current, $V_O = 0$                 | -70                       |     |     |                  |
| Output noise voltage, rms                     | $f = 10\text{ Hz}$ to $10\text{ kHz}$       | $C_{NR} = 0$              | 120 |     | $\mu\text{V}$    |
|   |   | $C_{NR} = 1\ \mu\text{F}$ | 30  |     |                  |
| Output voltage current, step response         | $V_O$ to 0.1%, $I_O = \pm 10\text{ mA}$     | $C_L = 0$                 | 290 |     | $\mu\text{s}$    |
|   |   | $C_L = 100\text{ pF}$     | 275 |     |                  |
|   | $V_O$ to 0.01%, $I_O = \pm 10\text{ mA}$    | $C_L = 0$                 | 400 |     |                  |
|   |   | $C_L = 100\text{ pF}$     | 390 |     |                  |
| Step response                                 | $V_I = 0$ to $12\text{ V}$ , $V_O$ to 0.1%  | $C_L = 100\text{ pF}$     | 12  |     | $\mu\text{s}$    |
|   | $V_I = 0$ to $12\text{ V}$ , $V_O$ to 0.01% |                           | 120 |     |                  |

† The listed values are not production tested.



## TYPICAL CHARACTERISTICS

**Table Of Graphs**

|  |                         | FIGURE |
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| Output voltage                                 | Distribution            | 1,2    |
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| Output voltage error                           | vs Input voltage        | 4      |
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|  | vs Free-air temperature | 6      |
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|  | vs Free-air temperature | 11,12  |
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| Output current                                 | vs Load capacitance     | 17     |

TYPICAL CHARACTERISTICS†

DISTRIBUTION OF OUTPUT VOLTAGE

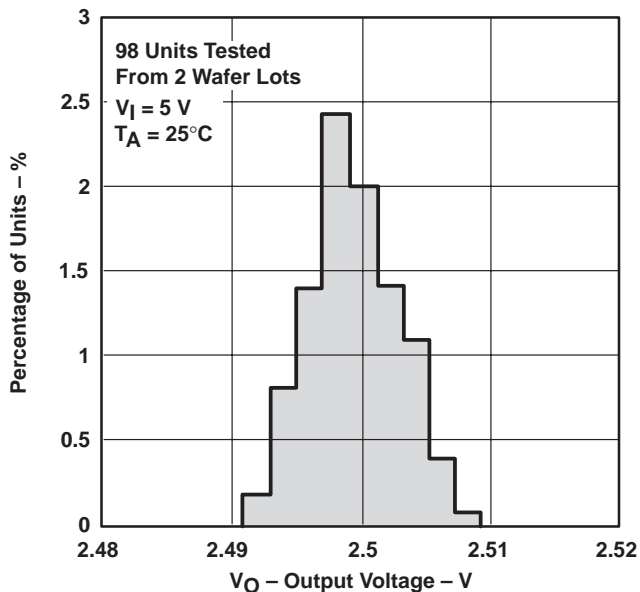


Figure 1

DISTRIBUTION OF OUTPUT VOLTAGE

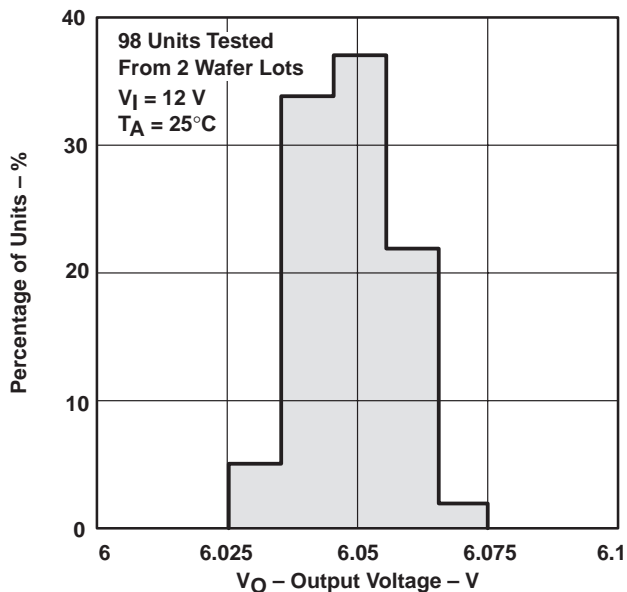


Figure 2

OUTPUT VOLTAGE CHANGE vs FREE-AIR TEMPERATURE

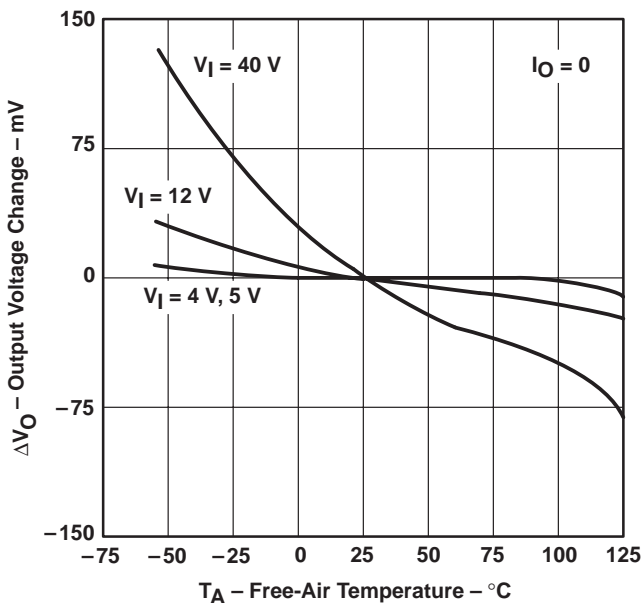


Figure 3

OUTPUT VOLTAGE ERROR vs INPUT VOLTAGE

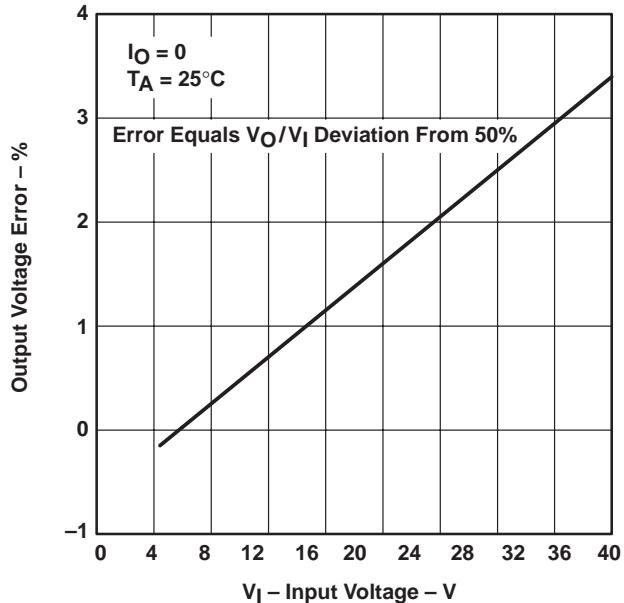
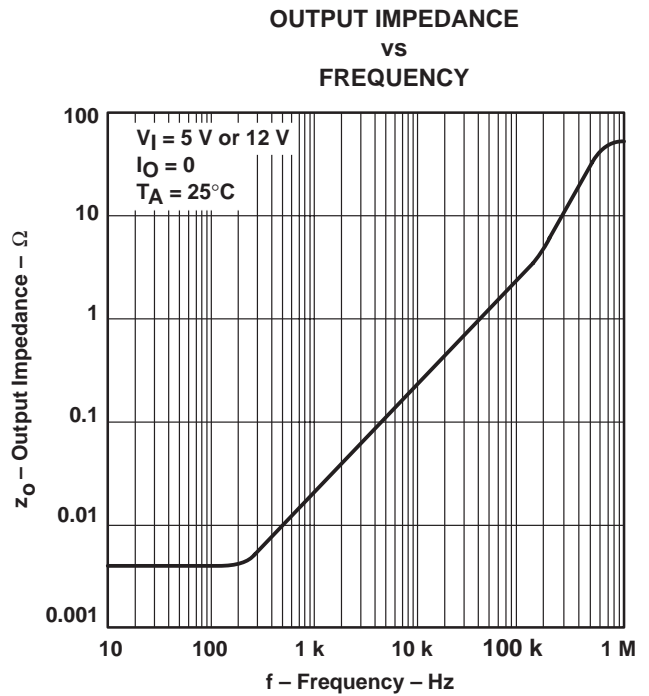
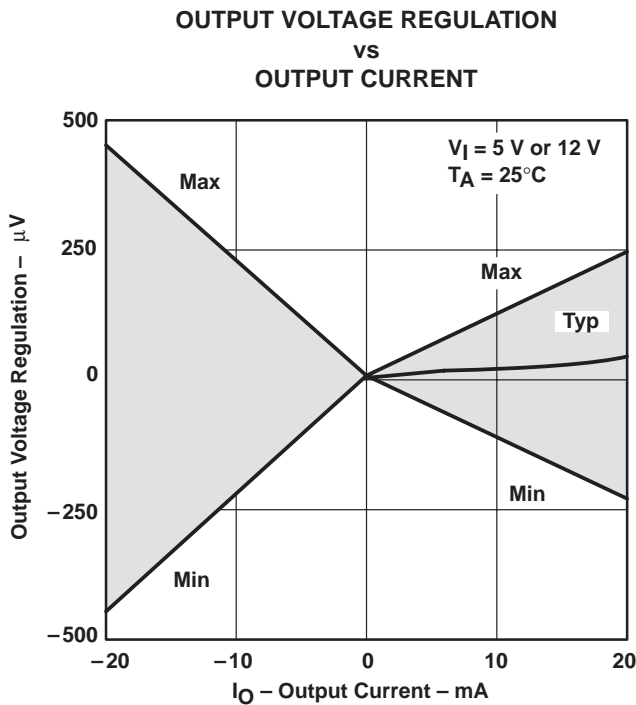
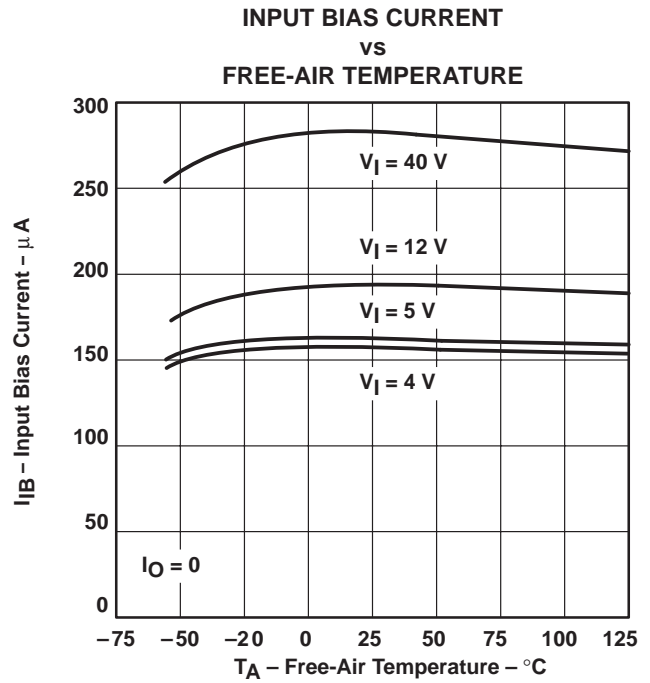
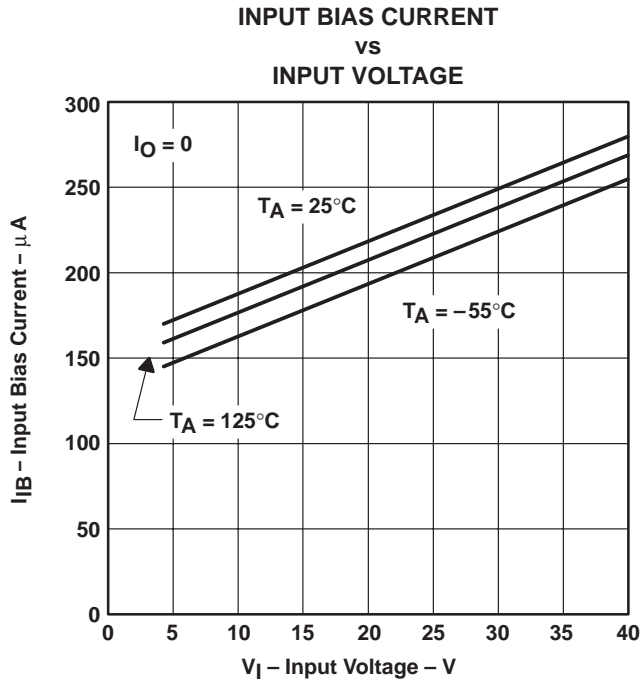


Figure 4

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

TYPICAL CHARACTERISTICS†



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

TYPICAL CHARACTERISTICS†

SHORT-CIRCUIT OUTPUT CURRENT  
 vs  
 INPUT VOLTAGE

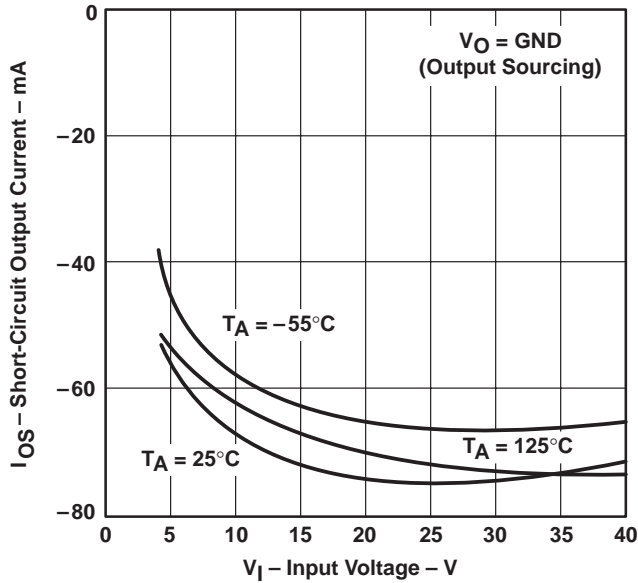


Figure 9

SHORT-CIRCUIT OUTPUT CURRENT  
 vs  
 INPUT VOLTAGE

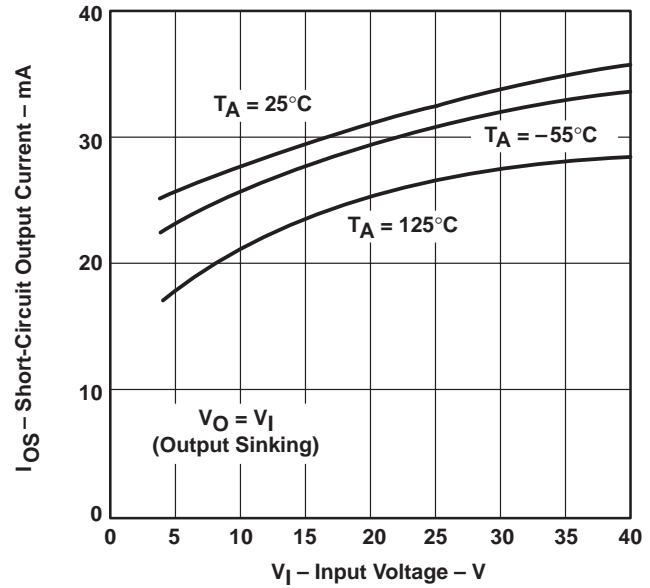


Figure 10

SHORT-CIRCUIT OUTPUT CURRENT  
 vs  
 FREE-AIR TEMPERATURE

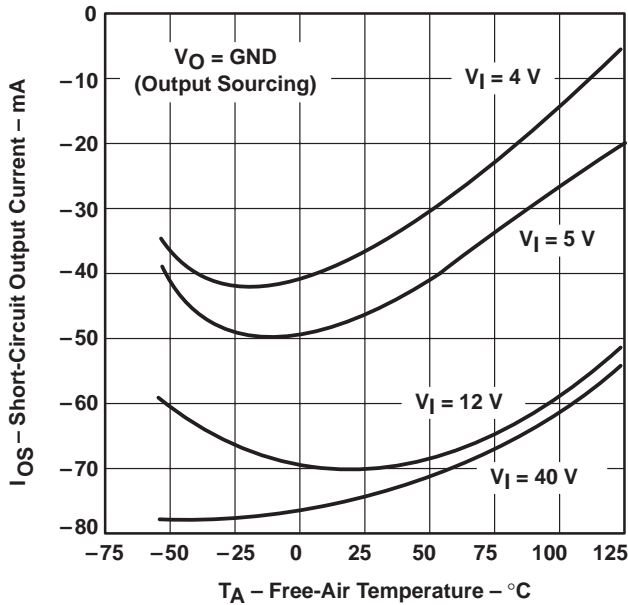


Figure 11

SHORT-CIRCUIT OUTPUT CURRENT  
 vs  
 FREE-AIR TEMPERATURE

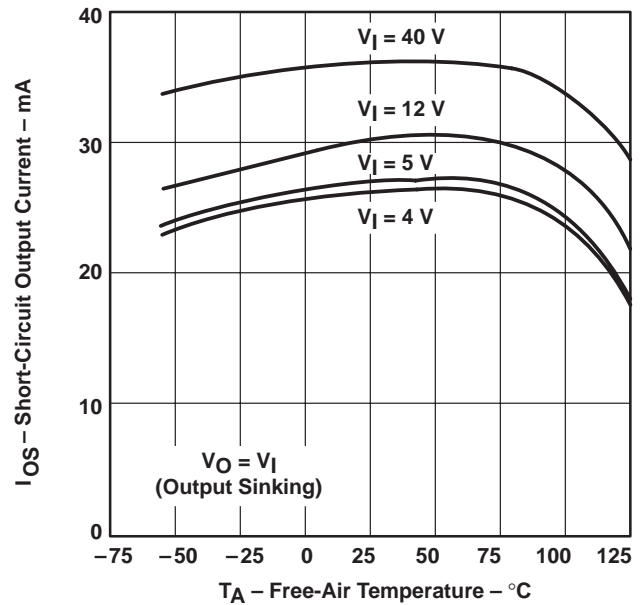


Figure 12

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

TYPICAL CHARACTERISTICS

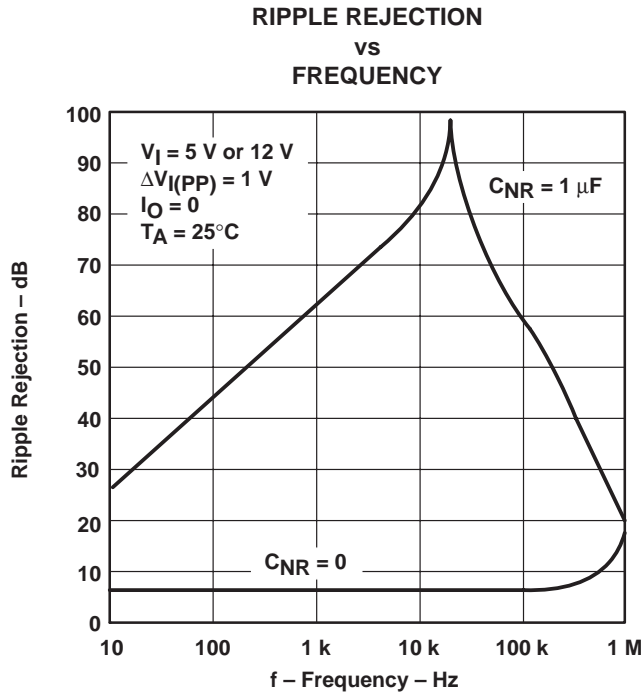


Figure 13

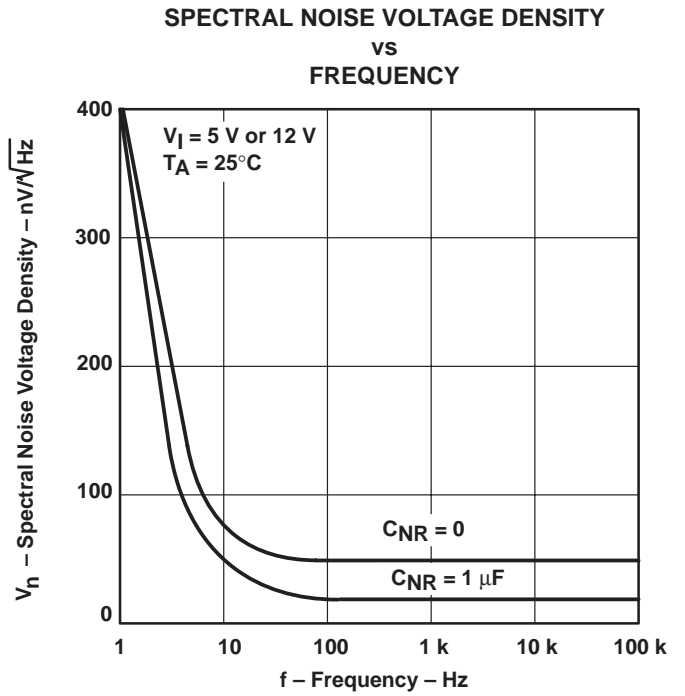


Figure 14

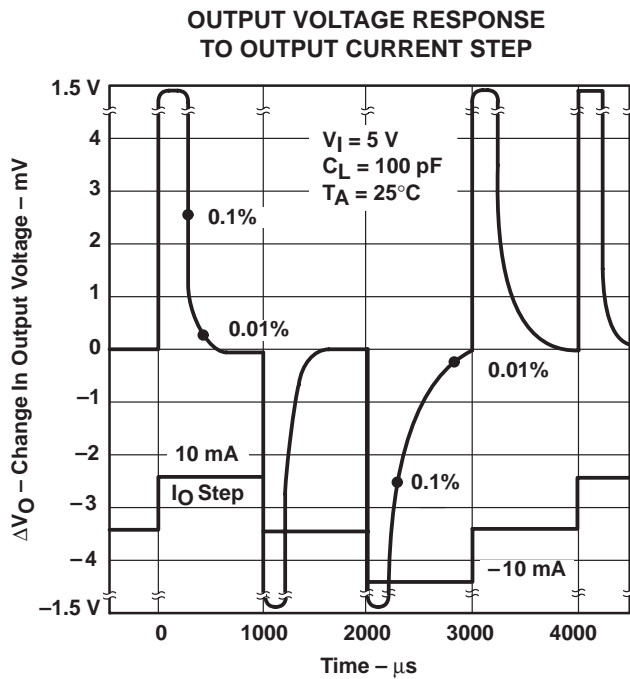


Figure 15

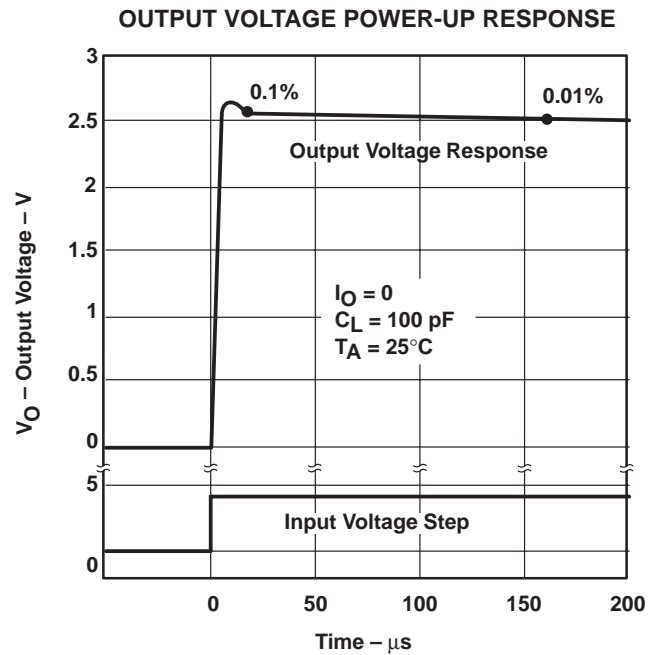


Figure 16

TYPICAL CHARACTERISTICS

STABILITY RANGE  
OUTPUT CURRENT  
vs  
LOAD CAPACITANCE

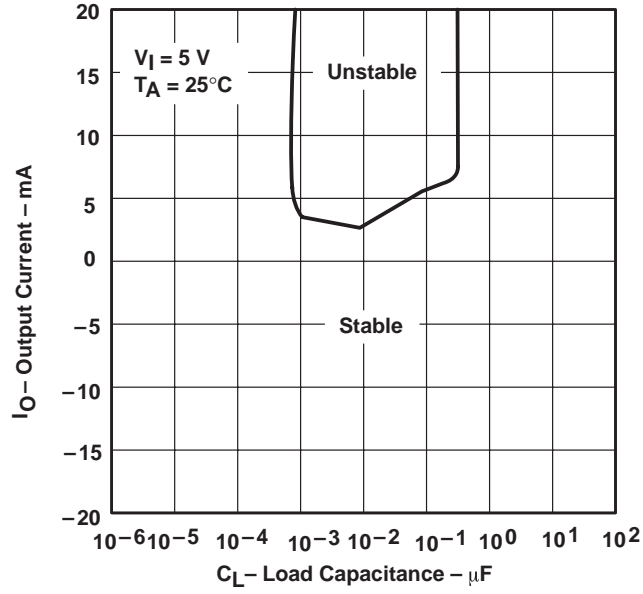


Figure 17



**MACROMODEL INFORMATION**

```
* TLE2426 OPERATIONAL AMPLIFIER "MACROMODEL" SUBCIRCUIT
* CREATED USING PARTS RELEASE 4.03 ON 08/21/90 AT 13:51
* REV (N/A) SUPPLY VOLTAGE: 5 V
* CONNECTIONS:
      FILTER
      |
      | INPUT
      | COMMON
      | OUTPUT
*
*
*
.SUBCKT TLE2426 1 3 4 5
```

```
C1 11 12 21.66E-12
C2 6 7 30.00E-12
C3 87 0 10.64E-9
CPSR 85 86 15.9E-9
DCM+ 81 82 DX
DCM- 83 81 DX
DC 5 53 DX
DE 54 5 DX
DLP 90 91 DX
DLN 92 90 DX
DP 4 3 DX
ECMR 84 99 (2,99) 1
EGND 99 0 POLY(2) (3,0) (4,0) 0 .5 .5
EPSR 85 0 POLY(1) (3,4) -16.22E-6 3.24E-6
ENSE 89 2 POLY(1) (88,0) 120E-6 1
FB 7 99 POLY(6) VB VC VE VLP VLN VPSR 0 74.8E6 -10E6 10E6 10E6 -10E6 74E6
GA 6 0 11 12 320.4E-6
GCM 0 6 10 99 1.013E-9
GPSR 85 86 (85,86) 100E-6
GRC1 4 11 (4,11) 3.204E-4
GRC2 4 12 (4,12) 3.204E-4
GRE1 13 10 (13,10) 1.038E-3
GRE2 14 10 (14,10) 1.038E-3
HLIM 90 0 VLIM 1K
HCMR 80 1 POLY(2) VCM+ VCM- 0 1E2 1E2
IRP 3 4 146E-6
IEE 3 10 DC 24.05E-6
IIO 2 0 .2E-9
I1 88 0 1E-21
Q1 11 89 13 QX
Q2 12 80 14 QX
R2 6 9 100.0E3
RCM 84 81 1K
REE 10 99 8.316E6
RN1 87 0 2.55E8
RN2 87 88 11.67E3
RO1 8 5 63
RO2 7 99 62
VCM+ 82 99 1.0
VCM- 83 99 -2.3
VB 9 0 DC 0
VC 3 53 DC 1.400
VE 54 4 DC 1.400
VLIM 7 8 DC 0
VLP 91 0 DC 30
VLN 0 92 DC 30
VPSR 0 86 DC 0
RFB 5 2 1K
RIN1 3 1 220K
RIN2 1 4 220K
.MODEL DX D(IS=800.OE-18)
.MODEL QX PNP(IS=800.OE-18 BF=480)
.ENDS
```

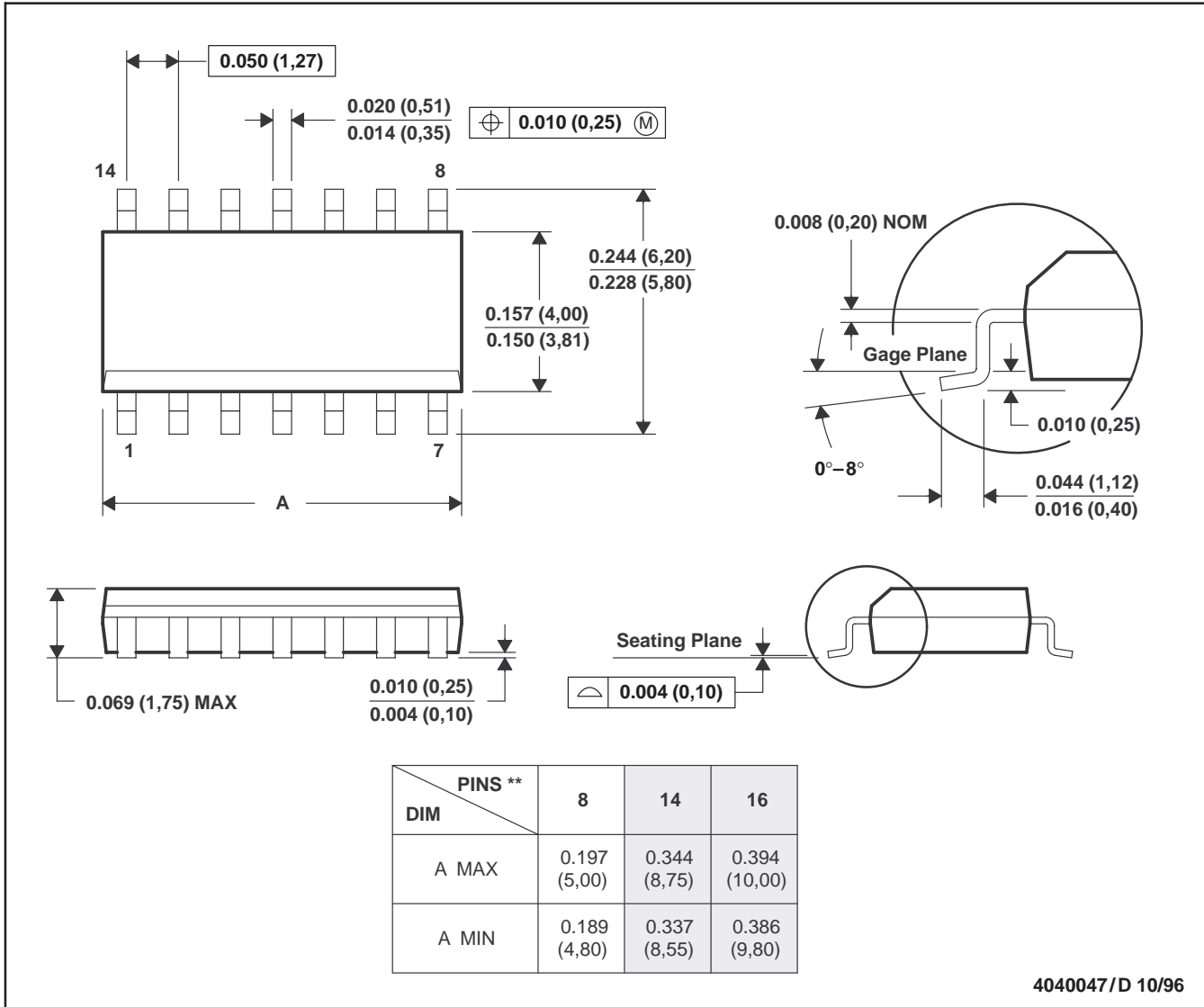
**TLE2426, TLE2426Y**  
**THE "RAIL SPLITTER"**  
**PRECISION VIRTUAL GROUND**  
 SLOS098D – AUGUST 1991 – REVISED MAY 1998

**MECHANICAL INFORMATION**

**D (R-PDSO-G\*\*)**

**PLASTIC SMALL-OUTLINE PACKAGE**

14 PIN SHOWN

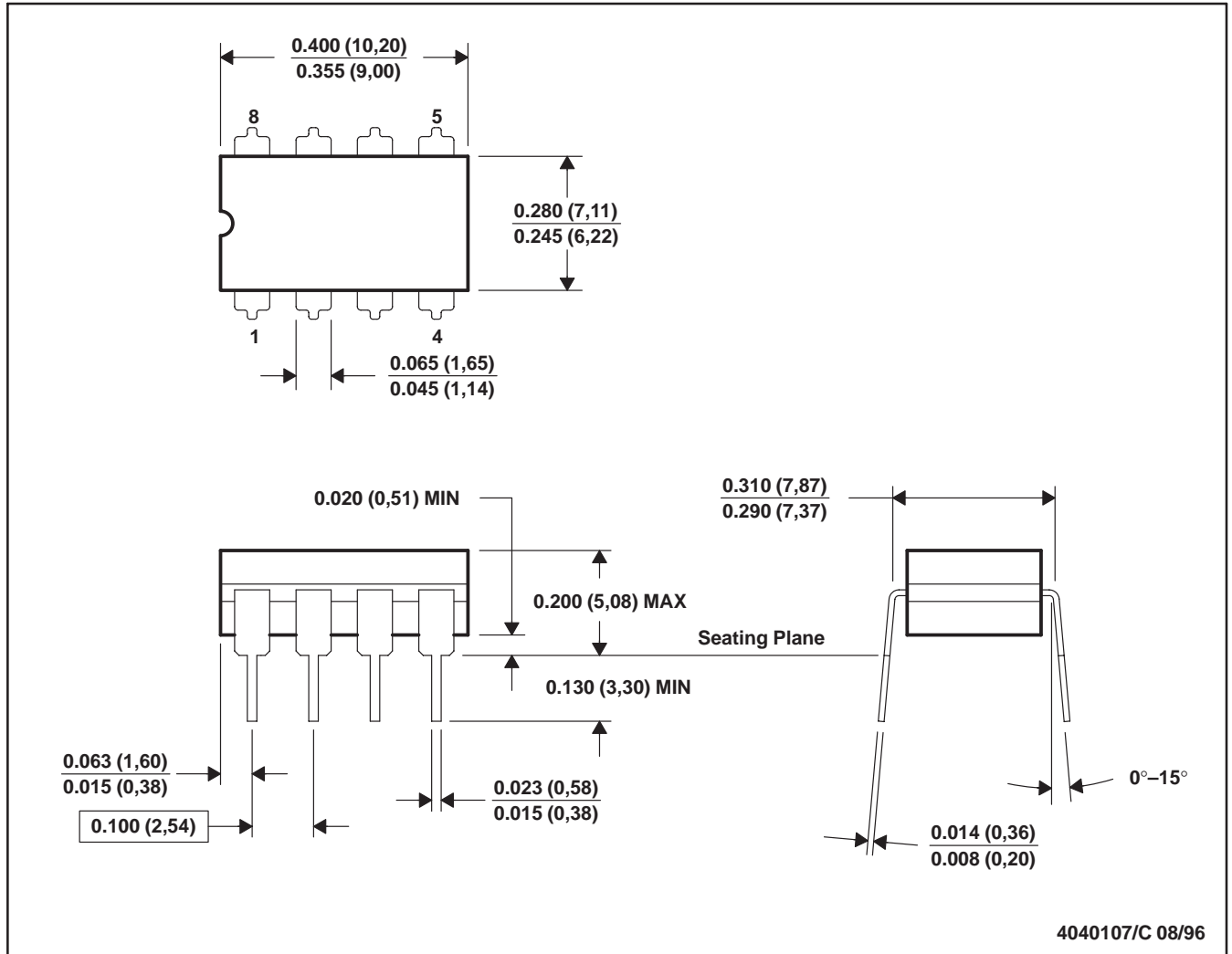


- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0.006 (0,15).  
 D. Falls within JEDEC MS-012

MECHANICAL INFORMATION

JG (R-GDIP-T8)

CERAMIC DUAL-IN-LINE PACKAGE



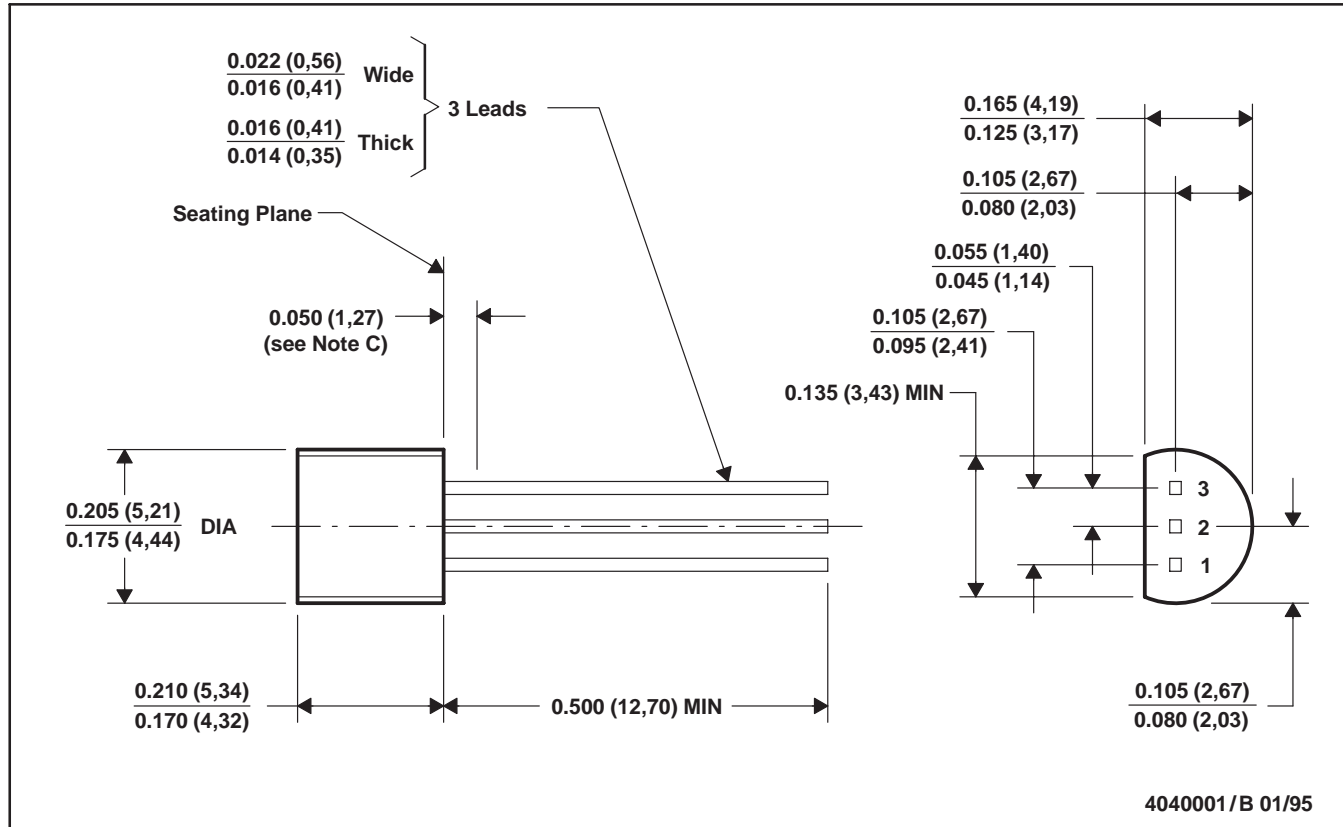
- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. This package can be hermetically sealed with a ceramic lid using glass frit.  
 D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal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

**TLE2426, TLE2426Y**  
**THE "RAIL SPLITTER"**  
**PRECISION VIRTUAL GROUND**  
 SLOS098D – AUGUST 1991 – REVISED MAY 1998

**MECHANICAL INFORMATION**

**LP (O-PBCY-W3)**

**PLASTIC CYLINDRICAL PACKAGE**

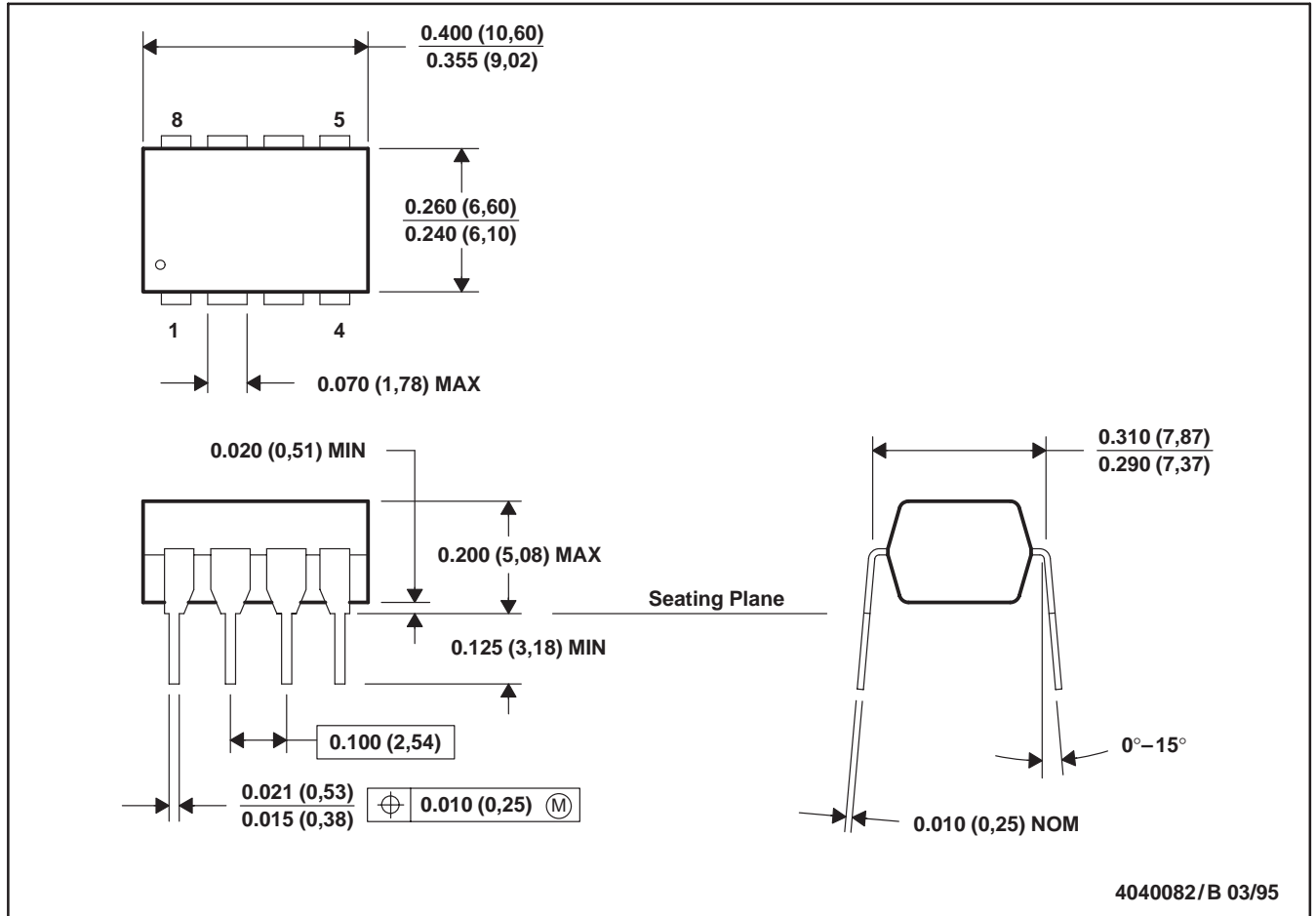


- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. Lead dimensions are not controlled within this area.  
 D. Falls within JEDEC TO-226AA (TO-226AA replaces TO-92)

MECHANICAL INFORMATION

P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE PACKAGE



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

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