

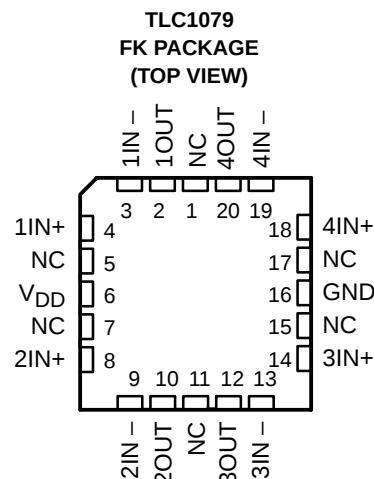
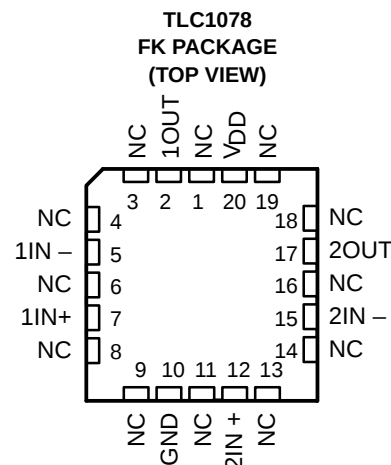
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- TLC1078**  
D, JG, OR P PACKAGE  
(TOP VIEW)

1OUT 1 8  $V_{DD}$   
 1IN- 2 7 2OUT  
 1IN+ 3 6 2IN-  
 GND 4 5 2IN+

**TLC1079**  
D, J, OR N PACKAGE  
(TOP VIEW)

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



1

**description (continued)**

The TLC107x incorporates internal ESD-protection circuits that will prevent functional failures at voltages up to 2000 V as tested under MIL-PRF-38535, Method 3015.2; however, care should be exercised when handling these devices as exposure to ESD may result in degradation of the device parametric performance. The TLC107x design also inhibits latch-up of the device inputs and outputs even with surge currents as large as 100 mA.

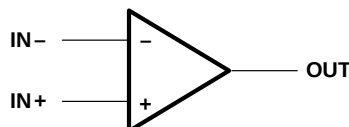
The C-suffix devices are characterized for operation from 0°C to 70°C. The I-suffix devices are characterized for operation from –40°C to 85°C. The M-suffix devices are characterized for operation over the full military temperature range of –55°C to 125°C. The wide range of packaging options includes small-outline and chip-carrier versions for high-density system applications.

**AVAILABLE OPTIONS**

| T <sub>A</sub> | PACKAGED DEVICES                  |                          |                    |                     |                    |                    | CHIP FORM <sup>‡</sup><br>(Y) |
|----------------|-----------------------------------|--------------------------|--------------------|---------------------|--------------------|--------------------|-------------------------------|
|                | SMALL OUTLINE <sup>†</sup><br>(D) | CHIP CARRIER<br>(FK)     | CERAMIC DIP<br>(J) | CERAMIC DIP<br>(JG) | PLASTIC DIP<br>(N) | PLASTIC DIP<br>(P) |                               |
| 0°C to 70°C    | TLC1078CD<br>TLC1079CD            | —                        | —                  | —                   | TLC1079CN          | TLC1078CP          | TLC1078Y<br>TLC1079Y          |
| –40°C to 85°C  | TLC1078ID<br>TLC1079ID            | —                        | —                  | —                   | TLC1079IN          | TLC1078IP          | —                             |
| –55°C to 125°C | TLC1078MD<br>TLC1079MD            | TLC1078MFK<br>TLC1079MFK | TLC1079MJ          | TLC1078MJG          | TLC1079MN          | TLC1078MP          | —                             |

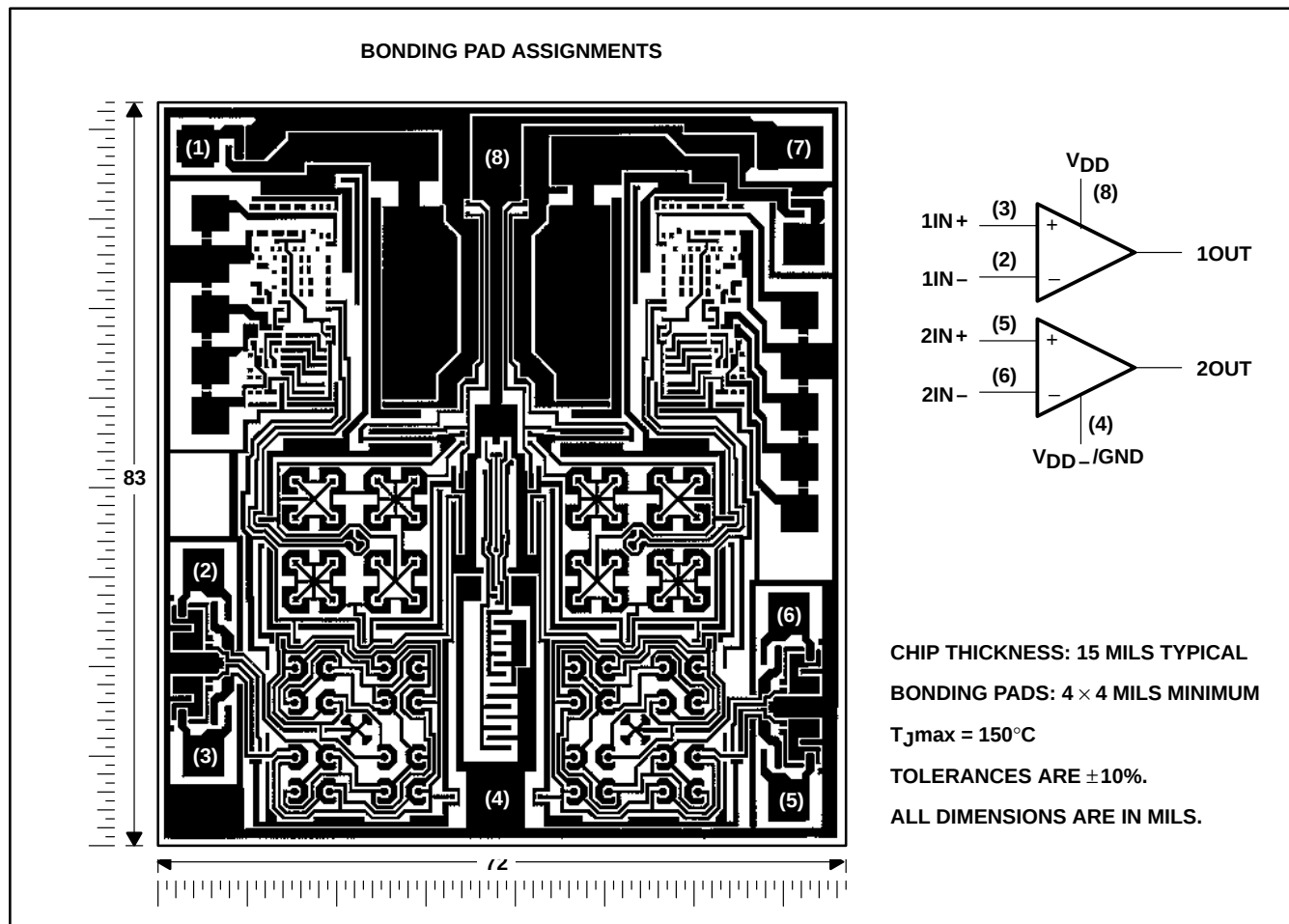
<sup>†</sup> The D package is available taped and reeled. Add the suffix R to the device type (e.g., TLC1078CDR).

<sup>‡</sup> Chip forms are tested 25°C only.

**symbol (each amplifier)**

## TLC1078Y chip information

This chip, when properly assembled, displays characteristics similar to the TLC1078C. Thermal compression or ultrasonic bonding may be used on the doped-aluminum bonding pads. Chips can be mounted with conductive epoxy or a gold-silicon preform.



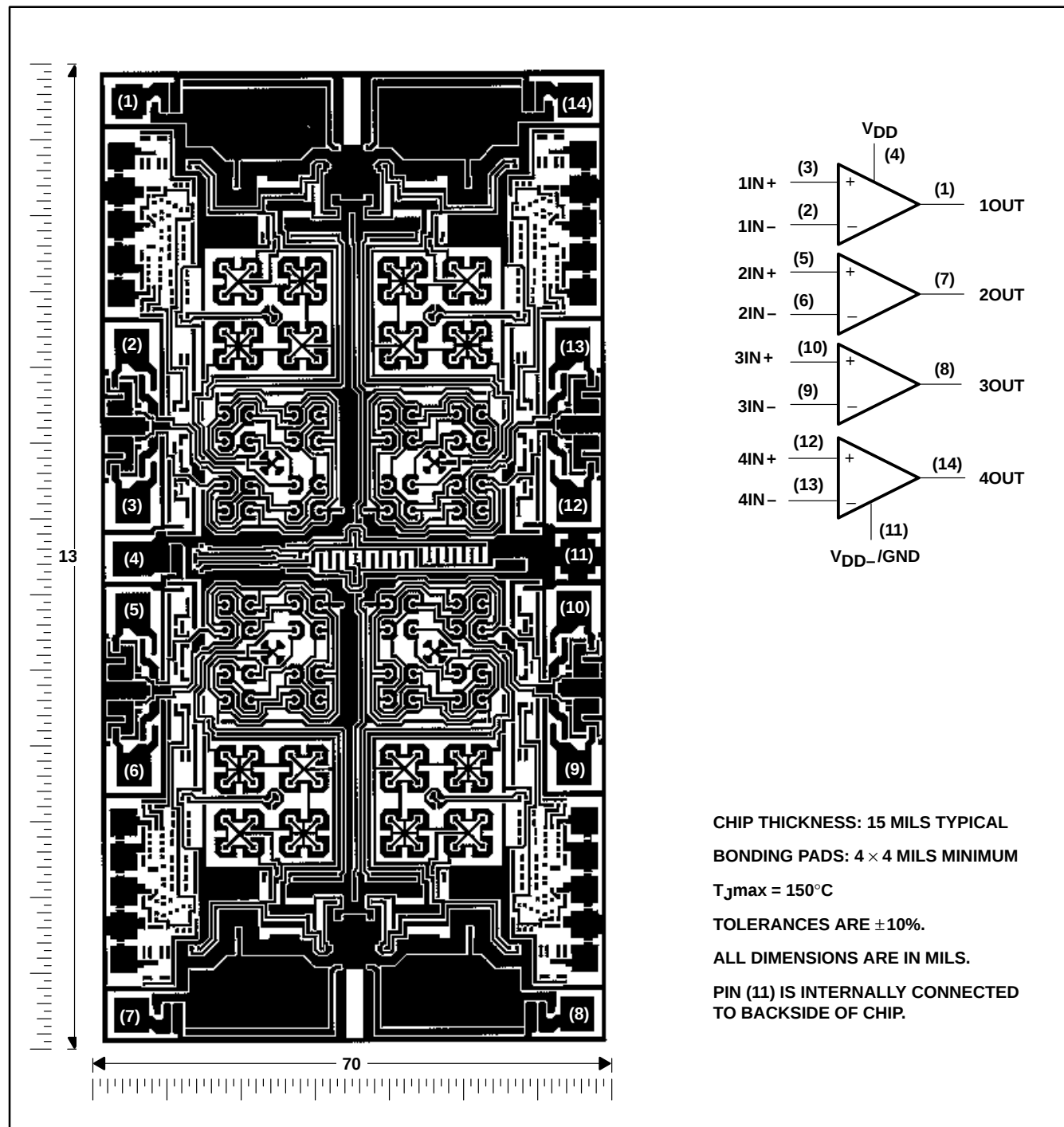
# TLC1078, TLC1078Y, TLC1079, TLC1079Y

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### TLC1079Y chip information

This chip, when properly assembled, display characteristics similar to the TLC1079C. Thermal compression or ultrasonic bonding may be used on the doped-aluminum bonding pads. Chips can be mounted with conductive epoxy or a gold-silicon preform.



The diagram illustrates a 10-bit SAR ADC architecture. It consists of three main functional blocks: a 10-bit DAC, a 10-bit comparator, and a 10-bit SAR logic block.

- 10-bit DAC:** This block generates the analog reference voltage for the comparator. It features a 10-bit input (IN-) and a 10-bit output (OUT). The DAC is implemented using a current mirror and a 10-bit resistor network. The input is connected to a 10-bit resistor network (R1, R2, R3, R4, R5, R6, R7, R8, R9, R10) which is connected to a 10-bit current mirror (Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8, Q9, Q10). The output of the DAC is connected to the 10-bit input of the comparator.
- 10-bit Comparator:** This block compares the 10-bit DAC output with the 10-bit SAR logic output. It is implemented using a 10-bit current mirror and a 10-bit resistor network. The input is connected to a 10-bit resistor network (R1, R2, R3, R4, R5, R6, R7, R8, R9, R10) which is connected to a 10-bit current mirror (Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8, Q9, Q10). The output of the comparator is connected to the 10-bit output of the SAR logic.
- 10-bit SAR Logic:** This block implements the Successive Approximation Register (SAR) logic. It is implemented using a 10-bit current mirror and a 10-bit resistor network. The input is connected to a 10-bit resistor network (R1, R2, R3, R4, R5, R6, R7, R8, R9, R10) which is connected to a 10-bit current mirror (Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8, Q9, Q10). The output of the SAR logic is connected to the 10-bit output of the comparator.

The circuit is powered by a 10-bit supply voltage (VDD) and a 10-bit ground (GND). The 10-bit output of the SAR logic is connected to the 10-bit output of the comparator, which is then connected to the 10-bit output of the DAC.

| ACTUAL DEVICE COMPONENT COUNT |         |         |
|-------------------------------|---------|---------|
| COMPONENT                     | TLC1078 | TLC1079 |
| Transistors                   | 38      | 76      |
| Resistors                     | 16      | 32      |
| Diodes                        | 12      | 24      |
| Capacitors                    | 2       | 4       |

**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>**

|                                                                               |                                            |
|-------------------------------------------------------------------------------|--------------------------------------------|
| Supply voltage, $V_{DD}$ (see Note 1)                                         | 18 V                                       |
| Differential input voltage, $V_{ID}$ (see Note 2)                             | $\pm V_{DD}$                               |
| Input voltage range, $V_I$ (any input)                                        | –0.3 V to $V_{DD}$                         |
| Input current, $I_I$ (each input)                                             | $\pm 5$ mA                                 |
| Output current, $I_O$ (each output)                                           | $\pm 30$ mA                                |
| Total current into $V_{DD}$ (see Note 3)                                      | 45 mA                                      |
| Duration of short-circuit at (or below) $T_A = 25^\circ\text{C}$ (see Note 3) | unlimited                                  |
| Continuous total power dissipation                                            | see Dissipation Rating Table               |
| Operating free-air temperature range, $T_A$ : C suffix                        | $0^\circ\text{C}$ to $70^\circ\text{C}$    |
| I suffix                                                                      | $-40^\circ\text{C}$ to $85^\circ\text{C}$  |
| M suffix                                                                      | $-55^\circ\text{C}$ to $125^\circ\text{C}$ |
| Storage temperature range                                                     | $-65^\circ\text{C}$ to $150^\circ\text{C}$ |
| Case temperature for 60 seconds: FK package                                   | $260^\circ\text{C}$                        |
| Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D or P package  | $260^\circ\text{C}$                        |
| Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: JG package      | $300^\circ\text{C}$                        |

<sup>†</sup> 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 network ground.  
2. Differential voltages are at  $IN+$  with respect to  $IN-$ .  
3. The output may be shorted to either supply. Temperature and/or supply voltages must be limited to ensure that the maximum dissipation ratings are not exceeded.

**DISSIPATION RATING TABLE**

| PACKAGE | $T_A \leq 25^\circ\text{C}$<br>POWER RATING | DERATING FACTOR<br>ABOVE $T_A = 25^\circ\text{C}$ | $T_A = 70^\circ\text{C}$<br>POWER RATING | $T_A = 85^\circ\text{C}$<br>POWER RATING | $T_A = 125^\circ\text{C}$<br>POWER RATING |
|---------|---------------------------------------------|---------------------------------------------------|------------------------------------------|------------------------------------------|-------------------------------------------|
| D–8     | 725 mW                                      | $5.8 \text{ mW}/^\circ\text{C}$                   | 464 mW                                   | 377 mW                                   | 145 mW                                    |
| D–14    | 950 mW                                      | $7.6 \text{ mW}/^\circ\text{C}$                   | 608 mW                                   | 494 mW                                   | 190 mW                                    |
| FK      | 1375 mW                                     | $11.0 \text{ mW}/^\circ\text{C}$                  | 880 mW                                   | 715 mW                                   | 275 mW                                    |
| J       | 1375 mW                                     | $11.0 \text{ mW}/^\circ\text{C}$                  | 880 mW                                   | 715 mW                                   | 275 mW                                    |
| JG      | 1050 mW                                     | $8.4 \text{ mW}/^\circ\text{C}$                   | 672 mW                                   | 546 mW                                   | 210 mW                                    |
| N       | 1150 mW                                     | $9.2 \text{ mW}/^\circ\text{C}$                   | 736 mW                                   | 598 mW                                   | 230 mW                                    |
| P       | 1000 mW                                     | $8.0 \text{ mW}/^\circ\text{C}$                   | 640 mW                                   | 520 mW                                   | 200 mW                                    |

**recommended operating conditions**

|                                       |                         | C SUFFIX |     | I SUFFIX |     | M SUFFIX |     | UNIT             |
|---------------------------------------|-------------------------|----------|-----|----------|-----|----------|-----|------------------|
|                                       |                         | MIN      | MAX | MIN      | MAX | MIN      | MAX |                  |
| Supply voltage, $V_{DD}$              |                         | 1.4      | 16  | 3        | 16  | 4        | 16  | V                |
| Common-mode input voltage, $V_{IC}$   | $V_{DD} = 5 \text{ V}$  | –0.2     | 4   | –0.2     | 4   | 0        | 4   | V                |
|                                       | $V_{DD} = 10 \text{ V}$ | –0.2     | 9   | –0.2     | 9   | 0        | 9   |                  |
| Operating free-air temperature, $T_A$ |                         | 0        | 70  | –40      | 85  | –55      | 125 | $^\circ\text{C}$ |

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**electrical characteristics at specified free-air temperature**

| PARAMETER        |                                                                      | TEST CONDITIONS                                                                                    | T <sub>A</sub> <sup>†</sup> | TLC1078C              |             |             |                        |             |      | UNIT  |
|------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-----------------------------|-----------------------|-------------|-------------|------------------------|-------------|------|-------|
|                  |                                                                      |                                                                                                    |                             | V <sub>DD</sub> = 5 V |             |             | V <sub>DD</sub> = 10 V |             |      |       |
|                  |                                                                      |                                                                                                    |                             | MIN                   | TYP         | MAX         | MIN                    | TYP         | MAX  |       |
| V <sub>IO</sub>  | Input offset voltage                                                 | V <sub>O</sub> = 1.4 V,<br>R <sub>S</sub> = 50 Ω,<br>V <sub>IC</sub> = 0,<br>R <sub>I</sub> = 1 MΩ | 25°C                        |                       | 160         | 450         |                        | 180         | 600  | μV    |
|                  |                                                                      |                                                                                                    | Full range                  |                       |             | 800         |                        |             | 950  |       |
| α <sub>VIO</sub> | Temperature coefficient of input offset voltage                      |                                                                                                    | 25°C to 70°C                |                       | 1.1         |             |                        | 1           |      | μV/°C |
| I <sub>IO</sub>  | Input offset current (see Note 4)                                    | V <sub>O</sub> = V <sub>DD</sub> / 2,<br>V <sub>IC</sub> = V <sub>DD</sub> / 2                     | 25°C                        |                       | 0.1         | 60          |                        | 0.1         | 60   | pA    |
|                  |                                                                      |                                                                                                    | 70°C                        |                       | 7           | 300         |                        | 7           | 300  |       |
| I <sub>IB</sub>  | Input bias current (see Note 4)                                      |                                                                                                    | 25°C                        |                       | 0.6         | 60          |                        | 0.7         | 60   | pA    |
|                  |                                                                      |                                                                                                    | 70°C                        |                       | 40          | 600         |                        | 50          | 600  |       |
| V <sub>ICR</sub> | Common-mode input voltage range (see Note 5)                         |                                                                                                    | 25°C                        | −0.2 to 4             | −0.3 to 4.2 |             | −0.2 to 9              | −0.3 to 9.2 | V    |       |
|                  |                                                                      |                                                                                                    | Full range                  | −0.2 to 3.5           |             | −0.2 to 8.5 |                        | V           |      |       |
| V <sub>OH</sub>  | High-level output voltage                                            | V <sub>ID</sub> = 100 mV,<br>R <sub>L</sub> = 1 MΩ                                                 | 25°C                        | 3.2                   | 4.1         |             | 8.2                    | 8.9         | V    |       |
|                  |                                                                      |                                                                                                    | 0°C                         | 3.2                   | 4.1         |             | 8.2                    | 8.9         |      |       |
|                  |                                                                      |                                                                                                    | 70°C                        | 3.2                   | 4.2         |             | 8.2                    | 8.9         |      |       |
| V <sub>OL</sub>  | Low-level output voltage                                             | V <sub>ID</sub> = −100 mV,<br>I <sub>OL</sub> = 0                                                  | 25°C                        |                       | 0           | 25          |                        | 0           | 25   | mV    |
|                  |                                                                      |                                                                                                    | 0°C                         |                       | 0           | 25          |                        | 0           | 25   |       |
|                  |                                                                      |                                                                                                    | 70°C                        |                       | 0           | 25          |                        | 0           | 25   |       |
| A <sub>VD</sub>  | Large-signal differential voltage amplification                      | R <sub>L</sub> = 1 MΩ,<br>See Note 6                                                               | 25°C                        | 250                   | 525         |             | 500                    | 850         | V/mV |       |
|                  |                                                                      |                                                                                                    | 0°C                         | 250                   | 680         |             | 500                    | 1010        |      |       |
|                  |                                                                      |                                                                                                    | 70°C                        | 200                   | 380         |             | 350                    | 660         |      |       |
| CMRR             | Common-mode rejection ratio                                          | V <sub>IC</sub> = V <sub>ICRmin</sub>                                                              | 25°C                        | 70                    | 95          |             | 75                     | 97          | dB   |       |
|                  |                                                                      |                                                                                                    | 0°C                         | 70                    | 95          |             | 75                     | 97          |      |       |
|                  |                                                                      |                                                                                                    | 70°C                        | 70                    | 95          |             | 75                     | 97          |      |       |
| k <sub>SVR</sub> | Supply-voltage rejection ratio (ΔV <sub>DD</sub> /ΔV <sub>IO</sub> ) | V <sub>O</sub> = 1.4 V                                                                             | 25°C                        | 75                    | 98          |             | 75                     | 98          | dB   |       |
|                  |                                                                      |                                                                                                    | 0°C                         | 75                    | 98          |             | 75                     | 98          |      |       |
|                  |                                                                      |                                                                                                    | 70°C                        | 75                    | 98          |             | 75                     | 98          |      |       |
| I <sub>DD</sub>  | Supply current (two amplifiers)                                      | V <sub>O</sub> = V <sub>DD</sub> / 2,<br>V <sub>IC</sub> = V <sub>DD</sub> / 2,<br>No load         | 25°C                        |                       | 20          | 34          |                        | 29          | 46   | μA    |
|                  |                                                                      |                                                                                                    | 0°C                         |                       | 24          | 42          |                        | 36          | 66   |       |
|                  |                                                                      |                                                                                                    | 70°C                        |                       | 16          | 28          |                        | 22          | 40   |       |

$^\dagger$  Full range is 0°C to 70°C.

NOTES: 4. The typical values of input bias current and input offset current below 5 pA were determined mathematically.

5. This range also applies to each input individually.

6. At  $V_{DD} = 5\text{ V}$ ,  $V_O = 0.25\text{ V}$  to  $2\text{ V}$ ; at  $V_{DD} = 10\text{ V}$ ,  $V_O = 1\text{ V}$  to  $6\text{ V}$ .

# TLC1078, TLC1078Y, TLC1079, TLC1079Y

## LinCMOS™ $\mu$ POWER PRECISION

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#### electrical characteristics at specified free-air temperature

| PARAMETER        |                                                                      | TEST CONDITIONS                                                                              | T <sub>A</sub> <sup>†</sup> | TLC1079C              |             |             |                        |       |     | UNIT |
|------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------------------|-----------------------|-------------|-------------|------------------------|-------|-----|------|
|                  |                                                                      |                                                                                              |                             | V <sub>DD</sub> = 5 V |             |             | V <sub>DD</sub> = 10 V |       |     |      |
|                  |                                                                      |                                                                                              |                             | MIN                   | TYP         | MAX         | MIN                    | TYP   | MAX |      |
| V <sub>IO</sub>  | Input offset voltage                                                 | V <sub>O</sub> = 1.4 V, V <sub>IC</sub> = 0,<br>R <sub>S</sub> = 50 Ω, R <sub>I</sub> = 1 MΩ | 25°C                        | 190                   | 850         | 200         | 1150                   | μV    |     |      |
|                  |                                                                      |                                                                                              | Full range                  | 1200                  |             | 1500        |                        |       |     |      |
| α <sub>VIO</sub> | Temperature coefficient of input offset voltage                      |                                                                                              | 25°C to 70°C                | 1.1                   |             | 1           |                        | μV/°C |     |      |
| I <sub>IO</sub>  | Input offset current (see Note 4)                                    | V <sub>O</sub> = V <sub>DD</sub> / 2, V <sub>IC</sub> = V <sub>DD</sub> / 2                  | 25°C                        | 0.1                   | 60          | 0.1         | 60                     | pA    |     |      |
|                  |                                                                      |                                                                                              | 70°C                        | 7                     | 300         | 7           | 300                    |       |     |      |
| I <sub>IB</sub>  | Input bias current (see Note 4)                                      |                                                                                              | 25°C                        | 0.6                   | 60          | 0.7         | 60                     | pA    |     |      |
|                  |                                                                      |                                                                                              | 70°C                        | 40                    | 600         | 50          | 600                    |       |     |      |
| V <sub>ICR</sub> | Common mode input voltage range (see Note 5)                         |                                                                                              | 25°C                        | −0.2 to 4             | −0.3 to 4.2 | −0.2 to 9   | −0.3 to 9.2            | V     |     |      |
|                  |                                                                      |                                                                                              | Full range                  | −0.2 to 3.5           |             | −0.2 to 8.5 |                        | V     |     |      |
| V <sub>OH</sub>  | High-level output voltage                                            | V <sub>ID</sub> = 100 mV, R <sub>L</sub> = 1 MΩ                                              | 25°C                        | 3.2                   | 4.1         | 8.2         | 8.9                    | V     |     |      |
|                  |                                                                      |                                                                                              | 0°C                         | 3.2                   | 4.1         | 8.2         | 8.9                    |       |     |      |
|                  |                                                                      |                                                                                              | 70°C                        | 3.2                   | 4.2         | 8.2         | 8.9                    |       |     |      |
| V <sub>OL</sub>  | Low-level output voltage                                             | V <sub>ID</sub> = −100 mV, I <sub>OL</sub> = 0                                               | 25°C                        | 0                     | 25          | 0           | 25                     | mV    |     |      |
|                  |                                                                      |                                                                                              | 0°C                         | 0                     | 25          | 0           | 25                     |       |     |      |
|                  |                                                                      |                                                                                              | 70°C                        | 0                     | 25          | 0           | 25                     |       |     |      |
| A <sub>VD</sub>  | Large-signal differential voltage amplification                      | R <sub>L</sub> = 1 MΩ, See Note 6                                                            | 25°C                        | 250                   | 525         | 500         | 850                    | V/mV  |     |      |
|                  |                                                                      |                                                                                              | 0°C                         | 250                   | 700         | 500         | 1010                   |       |     |      |
|                  |                                                                      |                                                                                              | 70°C                        | 200                   | 380         | 350         | 660                    |       |     |      |
| CMRR             | Common mode rejection ratio                                          | V <sub>IC</sub> = V <sub>ICRmin</sub>                                                        | 25°C                        | 70                    | 95          | 75          | 97                     | dB    |     |      |
|                  |                                                                      |                                                                                              | 0°C                         | 70                    | 95          | 75          | 97                     |       |     |      |
|                  |                                                                      |                                                                                              | 70°C                        | 70                    | 95          | 75          | 97                     |       |     |      |
| k <sub>SVR</sub> | Supply-voltage rejection ratio (ΔV <sub>DD</sub> /ΔV <sub>IO</sub> ) | V <sub>DD</sub> = 5 V to 10 V, V <sub>O</sub> = 1.4 V                                        | 25°C                        | 75                    | 98          | 75          | 98                     | dB    |     |      |
|                  |                                                                      |                                                                                              | 0°C                         | 75                    | 98          | 75          | 98                     |       |     |      |
|                  |                                                                      |                                                                                              | 70°C                        | 75                    | 98          | 75          | 98                     |       |     |      |
| I <sub>DD</sub>  | Supply current (four amplifiers)                                     | V <sub>O</sub> = V <sub>DD</sub> / 2, V <sub>IC</sub> = V <sub>DD</sub> / 2, No load         | 25°C                        | 40                    | 68          | 57          | 92                     | μA    |     |      |
|                  |                                                                      |                                                                                              | 0°C                         | 48                    | 84          | 72          | 132                    |       |     |      |
|                  |                                                                      |                                                                                              | 70°C                        | 31                    | 56          | 44          | 80                     |       |     |      |

$^\dagger$  Full range is 0°C to 70°C.

NOTES: 4. The typical values of input bias current and input offset current below 5 pA were determined mathematically.

5. This range also applies to each input individually.

6. At  $V_{DD} = 5\text{ V}$ ,  $V_O = 0.25\text{ V to }2\text{ V}$ ; at  $V_{DD} = 10\text{ V}$ ,  $V_O = 1\text{ V to }6\text{ V}$ .



**TLC1078, TLC1078Y, TLC1079, TLC1079Y**  
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**operating characteristics at specified free-air temperature**

| PARAMETER                                     | TEST CONDITIONS                                                                                | T <sub>A</sub> | TLC1078C              |     |     |                        |     |     | UNIT   |
|-----------------------------------------------|------------------------------------------------------------------------------------------------|----------------|-----------------------|-----|-----|------------------------|-----|-----|--------|
|                                               |                                                                                                |                | V <sub>DD</sub> = 5 V |     |     | V <sub>DD</sub> = 10 V |     |     |        |
|                                               |                                                                                                |                | MIN                   | TYP | MAX | MIN                    | TYP | MAX |        |
| SR    Slew rate at unity gain                 | R <sub>L</sub> = 1 MΩ,    C <sub>L</sub> = 20 pF,<br>V <sub>I(PP)</sub> = 1 V,    See Figure 1 | 25°C           | 32                    |     |     | 47                     |     |     | V/ms   |
|                                               |                                                                                                | 0°C            | 35                    |     |     | 51                     |     |     |        |
|                                               |                                                                                                | 70°C           | 27                    |     |     | 38                     |     |     |        |
| V <sub>n</sub> Equivalent input noise voltage | f = 1 kHz,    R <sub>S</sub> = 20 Ω                                                            | 25°C           | 68                    |     |     | 68                     |     |     | nV/√Hz |
| B <sub>1</sub> Unity-gain bandwidth           | C <sub>L</sub> = 20 pF,    See Figure 2                                                        | 25°C           | 85                    |     |     | 110                    |     |     | kHz    |
|                                               |                                                                                                | 0°C            | 100                   |     |     | 125                    |     |     |        |
|                                               |                                                                                                | 70°C           | 65                    |     |     | 90                     |     |     |        |
| φ <sub>m</sub> Phase margin at unity gain     | C <sub>L</sub> = 20 pF,    See Figure 2                                                        | 25°C           | 34°                   |     |     | 38°                    |     |     |        |
|                                               |                                                                                                | 0°C            | 36°                   |     |     | 40°                    |     |     |        |
|                                               |                                                                                                | 70°C           | 30°                   |     |     | 34°                    |     |     |        |

**operating characteristics at specified free-air temperature**

| PARAMETER      |                                | TEST CONDITIONS                                                                       |      | T <sub>A</sub> | TLC1079C              |     |     |                        |     |        | UNIT |
|----------------|--------------------------------|---------------------------------------------------------------------------------------|------|----------------|-----------------------|-----|-----|------------------------|-----|--------|------|
|                |                                |                                                                                       |      |                | V <sub>DD</sub> = 5 V |     |     | V <sub>DD</sub> = 10 V |     |        |      |
|                |                                |                                                                                       |      |                | MIN                   | TYP | MAX | MIN                    | TYP | MAX    |      |
| SR             | Slew rate at unity gain        | R <sub>L</sub> = 1 MΩ, C <sub>L</sub> = 20 pF, V <sub>I(PP)</sub> = 1 V, See Figure 1 | 25°C | 32             |                       |     | 47  |                        |     | V/ms   |      |
|                |                                |                                                                                       | 0°C  | 35             |                       |     | 51  |                        |     |        |      |
|                |                                |                                                                                       | 70°C | 27             |                       |     | 38  |                        |     |        |      |
| V <sub>n</sub> | Equivalent input noise voltage | f = 1 kHz, R <sub>S</sub> = 20 Ω                                                      | 25°C | 68             |                       |     | 68  |                        |     | nV/√Hz |      |
| B <sub>1</sub> | Unity-gain bandwidth           | C <sub>L</sub> = 20 pF, See Figure 2                                                  | 25°C | 85             |                       |     | 110 |                        |     | kHz    |      |
|                |                                |                                                                                       | 0°C  | 100            |                       |     | 125 |                        |     |        |      |
|                |                                |                                                                                       | 70°C | 65             |                       |     | 90  |                        |     |        |      |
| φ <sub>m</sub> | Phase margin at unity gain     | C <sub>L</sub> = 20 pF, See Figure 2                                                  | 25°C | 34°            |                       |     | 38° |                        |     |        |      |
|                |                                |                                                                                       | 0°C  | 36°            |                       |     | 40° |                        |     |        |      |
|                |                                |                                                                                       | 70°C | 30°            |                       |     | 34° |                        |     |        |      |

# TLC1078, TLC1078Y, TLC1079, TLC1079Y

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#### electrical characteristics at specified free-air temperature

| PARAMETER        |                                                                      | TEST CONDITIONS                                                                                 | T <sub>A</sub> <sup>†</sup> | TLC1078I              |                |      |                        |                |      | UNIT  |
|------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-----------------------------|-----------------------|----------------|------|------------------------|----------------|------|-------|
|                  |                                                                      |                                                                                                 |                             | V <sub>DD</sub> = 5 V |                |      | V <sub>DD</sub> = 10 V |                |      |       |
|                  |                                                                      |                                                                                                 |                             | MIN                   | TYP            | MAX  | MIN                    | TYP            | MAX  |       |
| V <sub>IO</sub>  | Input offset voltage                                                 | V <sub>O</sub> = 1.4 V,<br>R <sub>S</sub> = 50 Ω,<br>V <sub>IC</sub> = 0, R <sub>I</sub> = 1 MΩ | 25°C                        | 160                   |                | 450  | 180                    |                | 600  | μV    |
|                  |                                                                      |                                                                                                 | Full range                  |                       |                | 950  |                        |                | 1100 |       |
| α <sub>VIO</sub> | Temperature coefficient of input offset voltage                      |                                                                                                 | 25°C to 85°C                | 1.1                   |                |      | 1                      |                |      | μV/°C |
| I <sub>IO</sub>  | Input offset current (see Note 4)                                    | V <sub>O</sub> = V <sub>DD</sub> / 2,<br>V <sub>IC</sub> = V <sub>DD</sub> / 2                  | 25°C                        | 0.1                   |                | 60   | 0.1                    |                | 60   | pA    |
|                  |                                                                      |                                                                                                 | 85°C                        | 24                    |                | 1000 | 26                     |                | 1000 |       |
| I <sub>IB</sub>  | Input bias current (see Note 4)                                      |                                                                                                 | 25°C                        | 0.6                   |                | 60   | 0.7                    |                | 60   | pA    |
|                  |                                                                      | 85°C                                                                                            | 200                         |                       | 2000           | 220  |                        | 2000           |      |       |
| V <sub>ICR</sub> | Common-mode input voltage range (see Note 5)                         |                                                                                                 | 25°C                        | −0.2<br>to 4          | −0.3<br>to 4.2 |      | −0.2<br>to 9           | −0.3<br>to 9.2 |      | V     |
|                  |                                                                      |                                                                                                 | Full range                  | −0.2<br>to 3.5        |                |      | −0.2<br>to 8.5         |                |      | V     |
| V <sub>OH</sub>  | High-level output voltage                                            | V <sub>ID</sub> = 100 mV,<br>R <sub>L</sub> = 1 MΩ                                              | 25°C                        | 3.2                   | 4.1            |      | 8.2                    | 8.9            |      | V     |
|                  |                                                                      |                                                                                                 | −40°C                       | 3.2                   | 4.1            |      | 8.2                    | 8.9            |      |       |
|                  |                                                                      |                                                                                                 | 85°C                        | 3.2                   | 4.2            |      | 8.2                    | 8.9            |      |       |
| V <sub>OL</sub>  | Low-level output voltage                                             | V <sub>ID</sub> = −100 mV,<br>I <sub>OL</sub> = 0                                               | 25°C                        | 0                     |                | 25   | 0                      |                | 25   | mV    |
|                  |                                                                      |                                                                                                 | −40°C                       | 0                     |                | 25   | 0                      |                | 25   |       |
|                  |                                                                      |                                                                                                 | 85°C                        | 0                     |                | 25   | 0                      |                | 25   |       |
| A <sub>VD</sub>  | Large-signal differential voltage amplification                      | R <sub>L</sub> = 1 MΩ,<br>See Note 6                                                            | 25°C                        | 250                   | 525            |      | 500                    | 850            |      | V/mV  |
|                  |                                                                      |                                                                                                 | −40°C                       | 250                   | 900            |      | 500                    | 1550           |      |       |
|                  |                                                                      |                                                                                                 | 85°C                        | 150                   | 300            |      | 250                    | 585            |      |       |
| CMRR             | Common-mode rejection ratio                                          | V <sub>IC</sub> = V <sub>ICRmin</sub>                                                           | 25°C                        | 70                    | 95             |      | 75                     | 97             |      | dB    |
|                  |                                                                      |                                                                                                 | −40°C                       | 70                    | 95             |      | 75                     | 97             |      |       |
|                  |                                                                      |                                                                                                 | 85°C                        | 70                    | 95             |      | 75                     | 97             |      |       |
| k <sub>SVR</sub> | Supply-voltage rejection ratio (ΔV <sub>DD</sub> /ΔV <sub>IO</sub> ) | V <sub>O</sub> = 1.4 V                                                                          | 25°C                        | 75                    | 98             |      | 75                     | 98             |      | dB    |
|                  |                                                                      |                                                                                                 | −40°C                       | 75                    | 98             |      | 75                     | 98             |      |       |
|                  |                                                                      |                                                                                                 | 85°C                        | 75                    | 98             |      | 75                     | 98             |      |       |
| I <sub>DD</sub>  | Supply current (two amplifiers)                                      | V <sub>O</sub> = V <sub>DD</sub> / 2,<br>V <sub>IC</sub> = V <sub>DD</sub> / 2,<br>No load      | 25°C                        | 20                    |                | 34   | 29                     |                | 46   | μA    |
|                  |                                                                      |                                                                                                 | −40°C                       | 31                    |                | 54   | 50                     |                | 86   |       |
|                  |                                                                      |                                                                                                 | 85°C                        | 15                    |                | 26   | 20                     |                | 36   |       |

$^\dagger$  Full range is –40°C to 80°C.

NOTES: 4. The typical values of input bias current and input offset current below 5 pA were determined mathematically.

5. This range also applies to each input individually.

6. At  $V_{DD} = 5\text{ V}$ ,  $V_O = 0.25\text{ V}$  to  $2\text{ V}$ ; at  $V_{DD} = 10\text{ V}$ ,  $V_O = 1\text{ V}$  to  $6\text{ V}$ .



**electrical characteristics at specified free-air temperature**

| PARAMETER        |                                                                      | TEST CONDITIONS                                                                           | T <sub>A</sub> <sup>†</sup> | TLC1079I              |     |                       |                        |       |     | UNIT |
|------------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-----------------------------|-----------------------|-----|-----------------------|------------------------|-------|-----|------|
|                  |                                                                      |                                                                                           |                             | V <sub>DD</sub> = 5 V |     |                       | V <sub>DD</sub> = 10 V |       |     |      |
|                  |                                                                      |                                                                                           |                             | MIN                   | TYP | MAX                   | MIN                    | TYP   | MAX |      |
| V <sub>IO</sub>  | Input offset voltage                                                 | V <sub>O</sub> = 1.4 V, V <sub>IC</sub> = 0, R <sub>S</sub> = 50 Ω, R <sub>I</sub> = 1 MΩ | 25°C                        | 190 850               |     | 200 1150              |                        | μV    |     |      |
|                  |                                                                      |                                                                                           | Full range                  | 1350                  |     | 1650                  |                        |       |     |      |
| α <sub>VIO</sub> | Temperature coefficient of input offset voltage                      |                                                                                           | 25°C to 85°C                | 1.1                   |     | 1                     |                        | μV/°C |     |      |
| I <sub>IO</sub>  | Input offset current (see Note 4)                                    | V <sub>O</sub> = V <sub>DD</sub> / 2, V <sub>IC</sub> = V <sub>DD</sub> / 2               | 25°C                        | 0.1 60                |     | 0.1 60                |                        | pA    |     |      |
|                  |                                                                      |                                                                                           | 85°C                        | 24 1000               |     | 26 1000               |                        |       |     |      |
| I <sub>IB</sub>  | Input bias current (see Note 4)                                      |                                                                                           | 25°C                        | 0.6 60                |     | 0.7 60                |                        | pA    |     |      |
|                  |                                                                      |                                                                                           | 85°C                        | 200 2000              |     | 220 2000              |                        |       |     |      |
| V <sub>ICR</sub> | Common-mode input voltage range (see Note 5)                         |                                                                                           | 25°C                        | −0.2 to 4 −0.3 to 4.2 |     | −0.2 to 9 −0.3 to 9.2 |                        | V     |     |      |
|                  |                                                                      |                                                                                           | Full range                  | −0.2 to 3.5           |     | −0.2 to 8.5           |                        | V     |     |      |
| V <sub>OH</sub>  | High-level output voltage                                            | V <sub>ID</sub> = 100 mV, R <sub>L</sub> = 1 MΩ                                           | 25°C                        | 3.2 4.1               |     | 8.2 8.9               |                        | V     |     |      |
|                  |                                                                      |                                                                                           | −40°C                       | 3.2 4.1               |     | 8.2 8.9               |                        |       |     |      |
|                  |                                                                      |                                                                                           | 85°C                        | 3.2 4.2               |     | 8.2 8.9               |                        |       |     |      |
| V <sub>OL</sub>  | Low-level output voltage                                             | V <sub>ID</sub> = −100 mV, I <sub>OL</sub> = 0                                            | 25°C                        | 0 25                  |     | 0 25                  |                        | mV    |     |      |
|                  |                                                                      |                                                                                           | −40°C                       | 0 25                  |     | 0 25                  |                        |       |     |      |
|                  |                                                                      |                                                                                           | 85°C                        | 0 25                  |     | 0 25                  |                        |       |     |      |
| A <sub>VD</sub>  | Large-signal differential voltage amplification                      | R <sub>L</sub> = 1 MΩ, See Note 6                                                         | 25°C                        | 250 525               |     | 500 850               |                        | V/mV  |     |      |
|                  |                                                                      |                                                                                           | −40°C                       | 250 900               |     | 500 1550              |                        |       |     |      |
|                  |                                                                      |                                                                                           | 85°C                        | 150 330               |     | 250 585               |                        |       |     |      |
| CMRR             | Common-mode rejection ratio                                          | V <sub>IC</sub> = V <sub>ICRmin</sub>                                                     | 25°C                        | 70 95                 |     | 75 97                 |                        | dB    |     |      |
|                  |                                                                      |                                                                                           | −40°C                       | 70 95                 |     | 75 97                 |                        |       |     |      |
|                  |                                                                      |                                                                                           | 85°C                        | 70 95                 |     | 75 97                 |                        |       |     |      |
| k <sub>SVR</sub> | Supply-voltage rejection ratio (ΔV <sub>DD</sub> /ΔV <sub>IO</sub> ) | V <sub>DD</sub> = 5 V to 10 V, V <sub>O</sub> = 1.4 V                                     | 25°C                        | 75 98                 |     | 75 98                 |                        | dB    |     |      |
|                  |                                                                      |                                                                                           | −40°C                       | 75 98                 |     | 75 98                 |                        |       |     |      |
|                  |                                                                      |                                                                                           | 85°C                        | 75 98                 |     | 75 98                 |                        |       |     |      |
| I <sub>DD</sub>  | Supply current (four amplifiers)                                     | V <sub>O</sub> = V <sub>DD</sub> / 2, V <sub>IC</sub> = V <sub>DD</sub> / 2, No load      | 25°C                        | 40 68                 |     | 57 92                 |                        | μA    |     |      |
|                  |                                                                      |                                                                                           | −40°C                       | 62 108                |     | 98 172                |                        |       |     |      |
|                  |                                                                      |                                                                                           | 85°C                        | 29 52                 |     | 40 72                 |                        |       |     |      |

$^\dagger$  Full range is -40°C to 85°C.

NOTES: 4. The typical values of input bias current and input offset current below 5 pA were determined mathematically.

5. This range also applies to each input individually.

6. At  $V_{DD} = 5\text{ V}$ ,  $V_O = 0.25\text{ V to }2\text{ V}$ ; at  $V_{DD} = 10\text{ V}$ ,  $V_O = 1\text{ V to }6\text{ V}$ .

**TLC1078, TLC1078Y, TLC1079, TLC1079Y**  
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**operating characteristics at specified free-air temperature**

| PARAMETER                                     | TEST CONDITIONS                                                                                | T <sub>A</sub> | TLC1078I              |     |     |                        |     |     | UNIT   |
|-----------------------------------------------|------------------------------------------------------------------------------------------------|----------------|-----------------------|-----|-----|------------------------|-----|-----|--------|
|                                               |                                                                                                |                | V <sub>DD</sub> = 5 V |     |     | V <sub>DD</sub> = 10 V |     |     |        |
|                                               |                                                                                                |                | MIN                   | TYP | MAX | MIN                    | TYP | MAX |        |
| SR    Slew rate at unity gain                 | R <sub>L</sub> = 1 MΩ,    C <sub>L</sub> = 20 pF,<br>V <sub>I(PP)</sub> = 1 V,    See Figure 1 | 25°C           | 32                    |     |     | 47                     |     |     | V/ms   |
|                                               |                                                                                                | −40°C          | 39                    |     |     | 59                     |     |     |        |
|                                               |                                                                                                | 85°C           | 25                    |     |     | 34                     |     |     |        |
| V <sub>n</sub> Equivalent input noise voltage | f = 1 kHz,    R <sub>S</sub> = 20 Ω                                                            | 25°C           | 68                    |     |     | 68                     |     |     | nV/√Hz |
| B <sub>1</sub> Unity-gain bandwidth           | C <sub>L</sub> = 20 pF,    See Figure 2                                                        | 25°C           | 85                    |     |     | 110                    |     |     | kHz    |
|                                               |                                                                                                | −40°C          | 130                   |     |     | 155                    |     |     |        |
|                                               |                                                                                                | 85°C           | 55                    |     |     | 80                     |     |     |        |
| ϕ <sub>m</sub> Phase margin at unity gain     | C <sub>L</sub> = 20 pF,    See Figure 2                                                        | 25°C           | 34°                   |     |     | 38°                    |     |     |        |
|                                               |                                                                                                | −40°C          | 38°                   |     |     | 40°                    |     |     |        |
|                                               |                                                                                                | 85°C           | 28°                   |     |     | 32°                    |     |     |        |

**operating characteristics at specified free-air temperature**

| PARAMETER                                     | TEST CONDITIONS                                                                                | T <sub>A</sub> | TLC1079I              |     |     |                        |     |     | UNIT   |
|-----------------------------------------------|------------------------------------------------------------------------------------------------|----------------|-----------------------|-----|-----|------------------------|-----|-----|--------|
|                                               |                                                                                                |                | V <sub>DD</sub> = 5 V |     |     | V <sub>DD</sub> = 10 V |     |     |        |
|                                               |                                                                                                |                | MIN                   | TYP | MAX | MIN                    | TYP | MAX |        |
| SR    Slew rate at unity gain                 | R <sub>L</sub> = 1 MΩ,    C <sub>L</sub> = 20 pF,<br>V <sub>I(PP)</sub> = 1 V,    See Figure 1 | 25°C           | 32                    |     |     | 47                     |     |     | V/ms   |
|                                               |                                                                                                | −40°C          | 39                    |     |     | 59                     |     |     |        |
|                                               |                                                                                                | 85°C           | 25                    |     |     | 34                     |     |     |        |
| V <sub>n</sub> Equivalent input noise voltage | f = 1 kHz,    R <sub>S</sub> = 20 Ω                                                            | 25°C           | 68                    |     |     | 68                     |     |     | nV/√Hz |
| B <sub>1</sub> Unity-gain bandwidth           | C <sub>L</sub> = 20 pF,    See Figure 2                                                        | 25°C           | 85                    |     |     | 110                    |     |     | kHz    |
|                                               |                                                                                                | −40°C          | 130                   |     |     | 155                    |     |     |        |
|                                               |                                                                                                | 85°C           | 55                    |     |     | 80                     |     |     |        |
| ϕ <sub>m</sub> Phase margin at unity gain     | C <sub>L</sub> = 20 pF,    See Figure 2                                                        | 25°C           | 34°                   |     |     | 38°                    |     |     |        |
|                                               |                                                                                                | −40°C          | 38°                   |     |     | 42°                    |     |     |        |
|                                               |                                                                                                | 85°C           | 28°                   |     |     | 32°                    |     |     |        |

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**electrical characteristics at specified operating free-air temperature**

| PARAMETER        |                                                                      | TEST CONDITIONS                                                                                    | T <sub>A</sub> <sup>†</sup> | TLC1078M              |             |          |                        |       |     | UNIT |
|------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-----------------------------|-----------------------|-------------|----------|------------------------|-------|-----|------|
|                  |                                                                      |                                                                                                    |                             | V <sub>DD</sub> = 5 V |             |          | V <sub>DD</sub> = 10 V |       |     |      |
|                  |                                                                      |                                                                                                    |                             | MIN                   | TYP         | MAX      | MIN                    | TYP   | MAX |      |
| V <sub>IO</sub>  | Input offset voltage                                                 | V <sub>O</sub> = 1.4 V,<br>V <sub>IC</sub> = 0,<br>R <sub>S</sub> = 50 Ω,<br>R <sub>L</sub> = 1 MΩ | 25°C                        | 160                   | 450         | 180      | 600                    | μV    |     |      |
|                  |                                                                      |                                                                                                    | Full range                  | 1250                  |             | 1400     |                        |       |     |      |
| α <sub>VIO</sub> | Temperature coefficient of input offset voltage                      |                                                                                                    | 25°C to 125°C               | 1.4                   |             | 1.4      |                        | μV/°C |     |      |
| I <sub>IO</sub>  | Input offset current (see Note 4)                                    | V <sub>O</sub> = V <sub>DD</sub> / 2,<br>V <sub>IC</sub> = V <sub>DD</sub> / 2                     | 25°C                        | 0.1                   | 60          | 0.1      | 60                     | pA    |     |      |
|                  |                                                                      |                                                                                                    | 125°C                       | 1.4                   | 15          | 1.8      | 15                     | nA    |     |      |
| I <sub>IB</sub>  | Input bias current (see Note 4)                                      |                                                                                                    | 25°C                        | 0.6                   | 60          | 0.7      | 60                     | pA    |     |      |
|                  |                                                                      |                                                                                                    | 125°C                       | 9                     | 35          | 10       | 35                     | nA    |     |      |
| V <sub>ICR</sub> | Common-mode input voltage range (see Note 5)                         |                                                                                                    | 25°C                        | 0 to 4                | −0.3 to 4.2 | 0 to 9   | −0.3 to 9.2            | V     |     |      |
|                  |                                                                      |                                                                                                    | Full range                  | 0 to 3.5              |             | 0 to 8.5 |                        | V     |     |      |
| V <sub>OH</sub>  | High-level output voltage                                            | V <sub>ID</sub> = 100 mV,<br>R <sub>L</sub> = 1 MΩ                                                 | 25°C                        | 3.2                   | 4.1         | 8.2      | 8.9                    | V     |     |      |
|                  |                                                                      |                                                                                                    | −55°C                       | 3.2                   | 4.1         | 8.2      | 8.8                    |       |     |      |
|                  |                                                                      |                                                                                                    | 125°C                       | 3.2                   | 4.2         | 8.2      | 9                      |       |     |      |
| V <sub>OL</sub>  | Low-level output voltage                                             | V <sub>ID</sub> = −100 mV,<br>I <sub>OL</sub> = 0                                                  | 25°C                        | 0                     | 25          | 0        | 25                     | mV    |     |      |
|                  |                                                                      |                                                                                                    | −55°C                       | 0                     | 25          | 0        | 25                     |       |     |      |
|                  |                                                                      |                                                                                                    | 125°C                       | 0                     | 25          | 0        | 25                     |       |     |      |
| A <sub>VD</sub>  | Large-signal differential voltage amplification                      | R <sub>L</sub> = 1 MΩ ,<br>See Note 6                                                              | 25°C                        | 250                   | 525         | 500      | 850                    | V/mV  |     |      |
|                  |                                                                      |                                                                                                    | −55°C                       | 250                   | 950         | 500      | 1750                   |       |     |      |
|                  |                                                                      |                                                                                                    | 125°C                       | 35                    | 200         | 75       | 380                    |       |     |      |
| CMRR             | Common-mode rejection ratio                                          | V <sub>IC</sub> = V <sub>ICRmin</sub>                                                              | 25°C                        | 70                    | 95          | 75       | 97                     | dB    |     |      |
|                  |                                                                      |                                                                                                    | −55°C                       | 70                    | 95          | 75       | 97                     |       |     |      |
|                  |                                                                      |                                                                                                    | 125°C                       | 70                    | 85          | 75       | 91                     |       |     |      |
| k <sub>SVR</sub> | Supply-voltage rejection ratio (ΔV <sub>DD</sub> /ΔV <sub>IO</sub> ) | V <sub>O</sub> = 1.4 V                                                                             | 25°C                        | 75                    | 98          | 75       | 98                     | dB    |     |      |
|                  |                                                                      |                                                                                                    | −55°C                       | 70                    | 98          | 70       | 98                     |       |     |      |
|                  |                                                                      |                                                                                                    | 125°C                       | 70                    | 98          | 70       | 98                     |       |     |      |
| I <sub>DD</sub>  | Supply current (two amplifiers)                                      | V <sub>O</sub> = V <sub>DD</sub> / 2,<br>V <sub>IC</sub> = V <sub>DD</sub> / 2,<br>No load         | 25°C                        | 20                    | 34          | 29       | 46                     | μA    |     |      |
|                  |                                                                      |                                                                                                    | −55°C                       | 35                    | 60          | 56       | 96                     |       |     |      |
|                  |                                                                      |                                                                                                    | 125°C                       | 14                    | 24          | 18       | 30                     |       |     |      |

$^\dagger$  Full range is –55°C to 125°C.

NOTES: 4. The typical values of input bias current and input offset current below 5 pA were determined mathematically.

5. This range also applies to each input individually.

6. At  $V_{DD} = 5\text{ V}$ ,  $V_O = 0.25\text{ V}$  to  $2\text{ V}$ ; at  $V_{DD} = 10\text{ V}$ ,  $V_O = 1\text{ V}$  to  $6\text{ V}$ .

# TLC1078, TLC1078Y, TLC1079, TLC1079Y

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#### electrical characteristics at specified free-air temperature

| PARAMETER        |                                                                      | TEST CONDITIONS                                                                              | T <sub>A</sub> <sup>†</sup> | TLC1079M              |             |          |                        |             |      | UNIT  |
|------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------------------|-----------------------|-------------|----------|------------------------|-------------|------|-------|
|                  |                                                                      |                                                                                              |                             | V <sub>DD</sub> = 5 V |             |          | V <sub>DD</sub> = 10 V |             |      |       |
|                  |                                                                      |                                                                                              |                             | MIN                   | TYP         | MAX      | MIN                    | TYP         | MAX  |       |
| V <sub>IO</sub>  | Input offset voltage                                                 | V <sub>O</sub> = 1.4 V, V <sub>IC</sub> = 0,<br>R <sub>S</sub> = 50 Ω, R <sub>I</sub> = 1 MΩ | 25°C                        |                       | 190         | 850      |                        | 200         | 1150 | μV    |
|                  |                                                                      |                                                                                              | Full range                  |                       |             | 1600     |                        |             | 1900 |       |
| α <sub>VIO</sub> | Temperature coefficient of input offset voltage                      |                                                                                              | 25°C to 125°C               |                       | 1.4         |          |                        | 1.4         |      | μV/°C |
| I <sub>IO</sub>  | Input offset current (see Note 4)                                    | V <sub>O</sub> = V <sub>DD</sub> / 2,<br>V <sub>IC</sub> = V <sub>DD</sub> / 2               | 25°C                        |                       | 0.1         | 60       |                        | 0.1         | 60   | pA    |
|                  |                                                                      |                                                                                              | 125°C                       |                       | 1.4         | 15       |                        | 1.8         | 15   | nA    |
| I <sub>IB</sub>  | Input bias current (see Note 4)                                      |                                                                                              | 25°C                        |                       | 0.6         | 60       |                        | 0.7         | 60   | pA    |
|                  |                                                                      |                                                                                              | 125°C                       |                       | 9           | 35       |                        | 10          | 35   | nA    |
| V <sub>ICR</sub> | Common mode input voltage range (see Note 5)                         |                                                                                              | 25°C                        | 0 to 4                | –0.3 to 4.2 |          | 0 to 9                 | –0.3 to 9.2 |      | V     |
|                  |                                                                      |                                                                                              | Full range                  | 0 to 3.5              |             | 0 to 8.5 |                        |             | V    |       |
| V <sub>OH</sub>  | High-level output voltage                                            | V <sub>ID</sub> = 100 mV,<br>R <sub>L</sub> = 1 MΩ                                           | 25°C                        | 3.2                   | 4.1         |          | 8.2                    | 8.9         |      | V     |
|                  |                                                                      |                                                                                              | –55°C                       | 3.2                   | 4.1         |          | 8.2                    | 8.9         |      |       |
|                  |                                                                      |                                                                                              | 125°C                       | 3.2                   | 4.2         |          | 8.2                    | 9           |      |       |
| V <sub>OL</sub>  | Low-level output voltage                                             | V <sub>ID</sub> = –100 mV,<br>I <sub>OL</sub> = 0                                            | 25°C                        |                       | 0           | 25       |                        | 0           | 25   | mV    |
|                  |                                                                      |                                                                                              | –55°C                       |                       | 0           | 25       |                        | 0           | 25   |       |
|                  |                                                                      |                                                                                              | 125°C                       |                       | 0           | 25       |                        | 0           | 25   |       |
| A <sub>VD</sub>  | Large-signal differential voltage amplification                      | R <sub>L</sub> = 1 MΩ, See Note 6                                                            | 25°C                        | 250                   | 525         |          | 500                    | 850         |      | V/mV  |
|                  |                                                                      |                                                                                              | –55°C                       | 250                   | 950         |          | 500                    | 1750        |      |       |
|                  |                                                                      |                                                                                              | 125°C                       | 35                    | 200         |          | 75                     | 380         |      |       |
| CMRR             | Common-mode rejection ratio                                          | V <sub>IC</sub> = V <sub>ICRmin</sub>                                                        | 25°C                        | 70                    | 95          |          | 75                     | 97          |      | dB    |
|                  |                                                                      |                                                                                              | –55°C                       | 70                    | 95          |          | 75                     | 97          |      |       |
|                  |                                                                      |                                                                                              | 125°C                       | 70                    | 85          |          | 75                     | 91          |      |       |
| k <sub>SVR</sub> | Supply voltage rejection ratio (ΔV <sub>DD</sub> /ΔV <sub>IO</sub> ) | V <sub>DD</sub> = 5 V to 10 V,<br>V <sub>O</sub> = 1.4 V                                     | 25°C                        | 75                    | 98          |          | 75                     | 98          |      | dB    |
|                  |                                                                      |                                                                                              | –55°C                       | 70                    | 98          |          | 70                     | 98          |      |       |
|                  |                                                                      |                                                                                              | 125°C                       | 70                    | 98          |          | 70                     | 98          |      |       |
| I <sub>DD</sub>  | Supply current (four amplifiers)                                     | V <sub>O</sub> = V <sub>DD</sub> / 2,<br>V <sub>IC</sub> = V <sub>DD</sub> / 2, No load      | 25°C                        |                       | 40          | 68       |                        | 57          | 92   | μA    |
|                  |                                                                      |                                                                                              | –55°C                       |                       | 69          | 120      |                        | 111         | 192  |       |
|                  |                                                                      |                                                                                              | 125°C                       |                       | 27          | 48       |                        | 35          | 60   |       |

$^\dagger$  Full range is –55°C to 125°C.

NOTES: 4. The typical values of input bias current and input offset current below 5 pA were determined mathematically.

5. This range also applies to each input individually.

6. At  $V_{DD} = 5\text{ V}$ ,  $V_O = 0.25\text{ V to }2\text{ V}$ ; at  $V_{DD} = 10\text{ V}$ ,  $V_O = 1\text{ V to }6\text{ V}$ .



**TLC1078, TLC1078Y, TLC1079, TLC1079Y**  
**LinCMOS™  $\mu$ POWER PRECISION**  
**OPERATIONAL AMPLIFIERS**

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**operating characteristics at specified free-air temperature**

| PARAMETER                                     | TEST CONDITIONS                                                                                | T <sub>A</sub> | TLC1078M              |     |     |                        |     |     | UNIT   |
|-----------------------------------------------|------------------------------------------------------------------------------------------------|----------------|-----------------------|-----|-----|------------------------|-----|-----|--------|
|                                               |                                                                                                |                | V <sub>DD</sub> = 5 V |     |     | V <sub>DD</sub> = 10 V |     |     |        |
|                                               |                                                                                                |                | MIN                   | TYP | MAX | MIN                    | TYP | MAX |        |
| SR    Slew rate at unity gain                 | R <sub>L</sub> = 1 MΩ,    C <sub>L</sub> = 20 pF,<br>V <sub>I(PP)</sub> = 1 V,    See Figure 1 | 25°C           | 32                    |     |     | 47                     |     |     | V/ms   |
|                                               |                                                                                                | –55°C          | 41                    |     |     | 63                     |     |     |        |
|                                               |                                                                                                | 125°C          | 20                    |     |     | 27                     |     |     |        |
| V <sub>n</sub> Equivalent input noise voltage | f = 1 kHz,    R <sub>S</sub> = 20 Ω                                                            | 25°C           | 68                    |     |     | 68                     |     |     | nV/√Hz |
| B <sub>1</sub> Unity-gain bandwidth           | C <sub>L</sub> = 20 pF,    See Figure 2                                                        | 25°C           | 85                    |     |     | 110                    |     |     | kHz    |
|                                               |                                                                                                | –55°C          | 140                   |     |     | 165                    |     |     |        |
|                                               |                                                                                                | 125°C          | 45                    |     |     | 70                     |     |     |        |
| φ <sub>m</sub> Phase margin at unity gain     | C <sub>L</sub> = 20 pF,    See Figure 2                                                        | 25°C           | 34°                   |     |     | 38°                    |     |     |        |
|                                               |                                                                                                | –55°C          | 39°                   |     |     | 43°                    |     |     |        |
|                                               |                                                                                                | 125°C          | 25°                   |     |     | 29°                    |     |     |        |

**operating characteristics at specified free-air temperature**

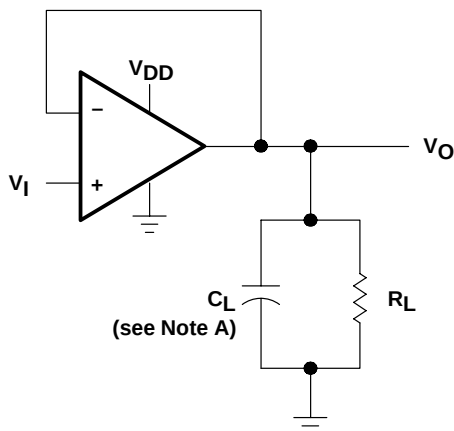
| PARAMETER                                     | TEST CONDITIONS                                                                                | T <sub>A</sub> | TLC1079M              |     |     |                        |     |     | UNIT   |
|-----------------------------------------------|------------------------------------------------------------------------------------------------|----------------|-----------------------|-----|-----|------------------------|-----|-----|--------|
|                                               |                                                                                                |                | V <sub>DD</sub> = 5 V |     |     | V <sub>DD</sub> = 10 V |     |     |        |
|                                               |                                                                                                |                | MIN                   | TYP | MAX | MIN                    | TYP | MAX |        |
| SR    Slew rate at unity gain                 | R <sub>L</sub> = 1 MΩ,    C <sub>L</sub> = 20 pF,<br>V <sub>I(PP)</sub> = 1 V,    See Figure 1 | 25°C           | 32                    |     |     | 47                     |     |     | V/ms   |
|                                               |                                                                                                | –55°C          | 41                    |     |     | 63                     |     |     |        |
|                                               |                                                                                                | 125°C          | 20                    |     |     | 27                     |     |     |        |
| V <sub>n</sub> Equivalent input noise voltage | f = 1 kHz,    R <sub>S</sub> = 20 Ω                                                            | 25°C           | 68                    |     |     | 68                     |     |     | nV/√Hz |
| B <sub>1</sub> Unity-gain bandwidth           | C <sub>L</sub> = 20 pF,    See Figure 2                                                        | 25°C           | 85                    |     |     | 110                    |     |     | kHz    |
|                                               |                                                                                                | –55°C          | 140                   |     |     | 165                    |     |     |        |
|                                               |                                                                                                | 125°C          | 45                    |     |     | 70                     |     |     |        |
|                                               |                                                                                                | 25°C           | 34°                   |     |     | 38°                    |     |     |        |
| φ <sub>m</sub> Phase margin at unity gain     | C <sub>L</sub> = 20 pF,    See Figure 2                                                        | –55°C          | 39°                   |     |     | 43°                    |     |     |        |
|                                               |                                                                                                | 125°C          | 25°                   |     |     | 29°                    |     |     |        |

# TLC1078, TLC1078Y, TLC1079, TLC1079Y

## LinCMOS™ $\mu$ POWER PRECISION OPERATIONAL AMPLIFIERS

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### PARAMETER MEASUREMENT INFORMATION



NOTE A:  $C_L$  includes fixture capacitance.

Figure 1. Slew-Rate Test Circuit

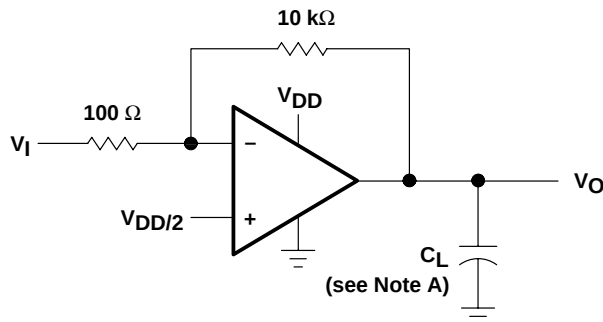


Figure 2. Unity-Gain Bandwidth and Phase-Margin Test Circuit

### TYPICAL CHARACTERISTICS

Table of Graphs

|                |                                                 |                                                                                                                         | FIGURE                       |
|----------------|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|------------------------------|
| $\alpha_{VIO}$ | Temperature coefficient of input offset voltage | Distribution                                                                                                            | 3 – 6                        |
| $I_{IB}$       | Input bias current                              | vs Free-air temperature                                                                                                 | 7                            |
| $I_{IO}$       | Input offset current                            | vs Free-air temperature                                                                                                 | 7                            |
| $V_{IC}$       | Common-mode input voltage                       | vs Supply voltage                                                                                                       | 8                            |
| $V_{OH}$       | High-level output voltage                       | vs High-level output current<br>vs Supply voltage<br>vs Free-air temperature                                            | 9, 10<br>11<br>12            |
| $V_{OL}$       | Low-level output voltage                        | vs Common-mode input voltage<br>vs Differential input voltage<br>vs Free-air temperature<br>vs Low-level output current | 13, 14<br>15<br>16<br>17, 18 |
| $A_{VD}$       | Large-signal differential voltage amplification | vs Supply voltage<br>vs Free-air temperature<br>vs Frequency                                                            | 19<br>20<br>21, 22           |
| $V_{OM}$       | Maximum peak output voltage                     | vs Frequency                                                                                                            | 23                           |
| $I_{DD}$       | Supply current                                  | vs Supply voltage<br>vs Free-air temperature                                                                            | 24<br>25                     |
| SR             | Slew rate                                       | vs Supply voltage<br>vs Free-air temperature                                                                            | 26<br>27                     |
|                | Normalized slew rate                            | vs Free-air temperature                                                                                                 | 28                           |
| $V_n$          | Equivalent input noise voltage                  | vs Frequency                                                                                                            | 29                           |
| $B_1$          | Unity-gain bandwidth                            | vs Supply voltage<br>vs Free-air temperature                                                                            | 30<br>31                     |
| $\phi_m$       | Phase margin                                    | vs Supply voltage<br>vs Free-air temperature<br>vs Capacitive load                                                      | 32<br>33<br>34               |
|                | Phase shift                                     | vs Frequency                                                                                                            | 21, 22                       |

## TYPICAL CHARACTERISTICS

DISTRIBUTION OF TLC1078  
 INPUT OFFSET VOLTAGE  
 TEMPERATURE COEFFICIENT

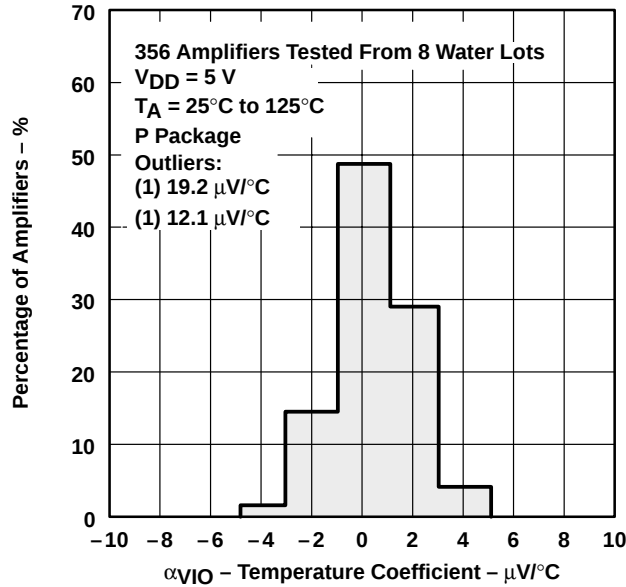


Figure 3

DISTRIBUTION OF TLC1078  
 INPUT OFFSET VOLTAGE  
 TEMPERATURE COEFFICIENT

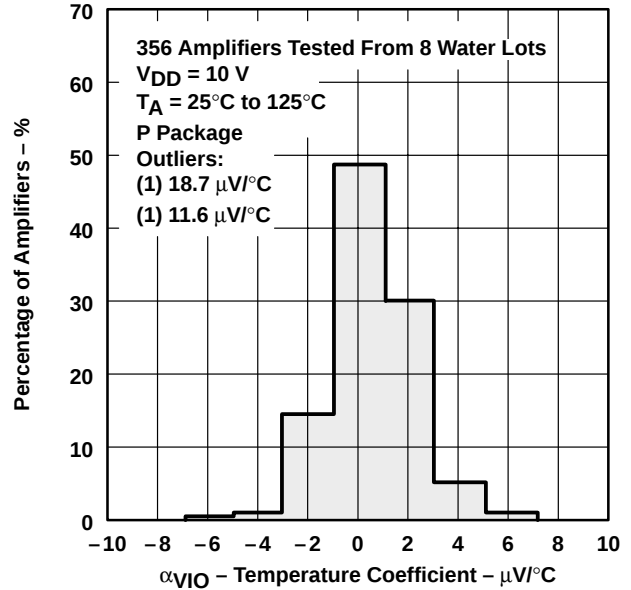


Figure 4

DISTRIBUTION OF TLC1079  
 INPUT OFFSET VOLTAGE  
 TEMPERATURE COEFFICIENT

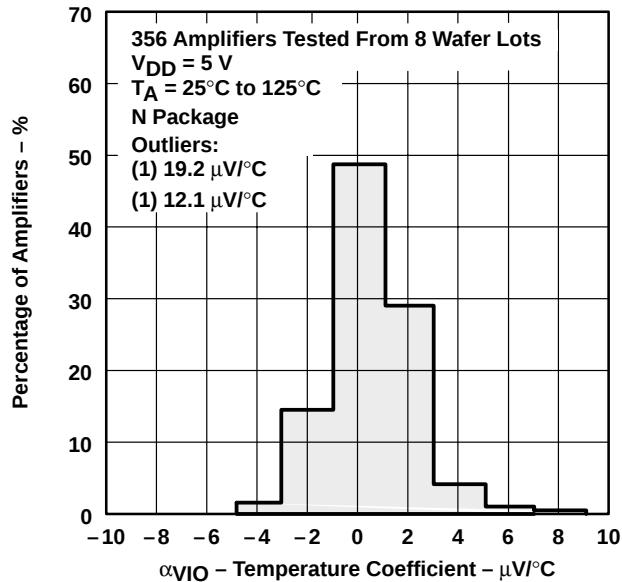


Figure 5

DISTRIBUTION OF TLC1079  
 INPUT OFFSET VOLTAGE  
 TEMPERATURE COEFFICIENT

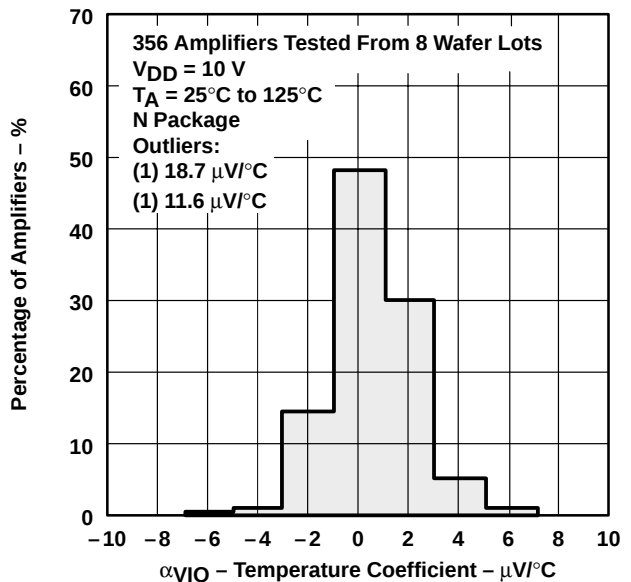
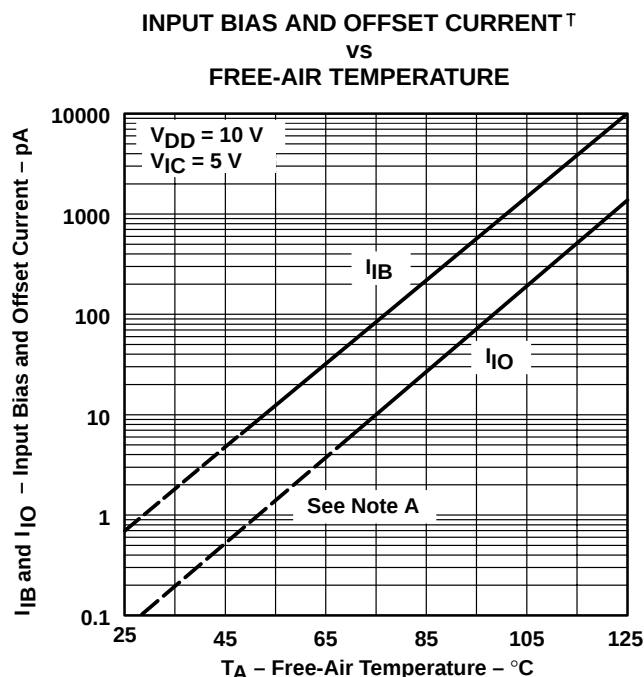


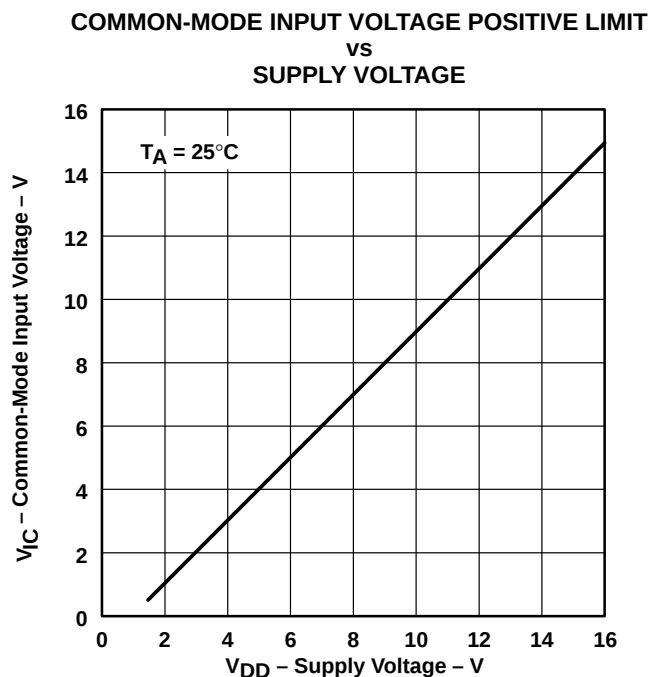
Figure 6

## TYPICAL CHARACTERISTICS

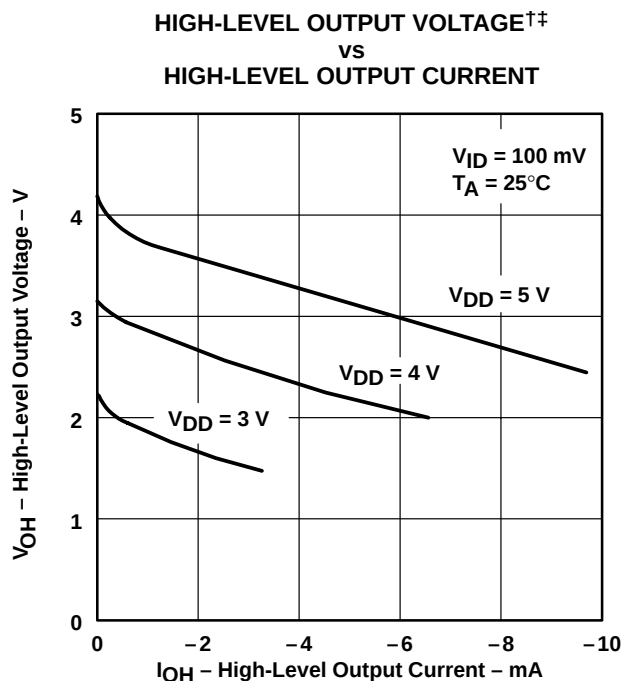


NOTE A: The typical values of input bias current and input offset current below 5 pA were determined mathematically.

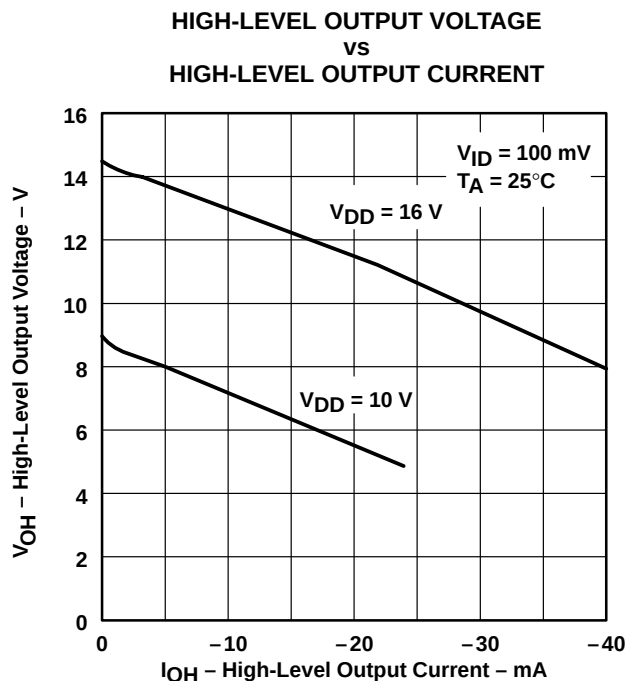
**Figure 7**



**Figure 8**



**Figure 9**



**Figure 10**

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

‡ The  $V_{DD} = 3\text{ V}$  curve does not apply to the TLC107xM.

## TYPICAL CHARACTERISTICS

HIGH-LEVEL OUTPUT VOLTAGE  
 vs  
 SUPPLY VOLTAGE

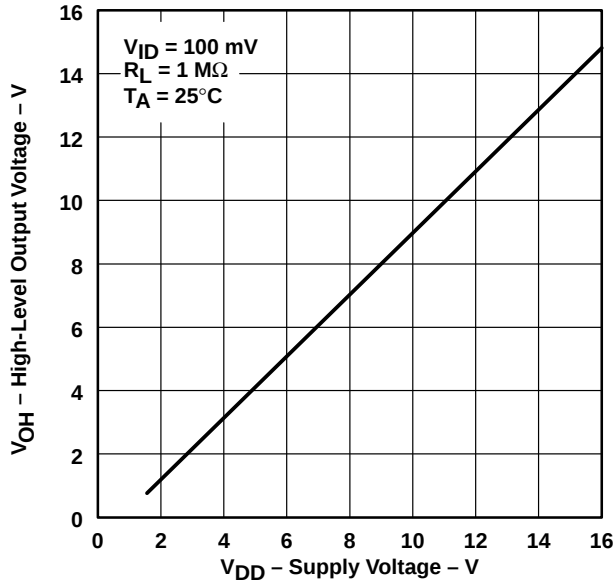


Figure 11

HIGH-LEVEL OUTPUT VOLTAGE†  
 vs  
 FREE-AIR TEMPERATURE

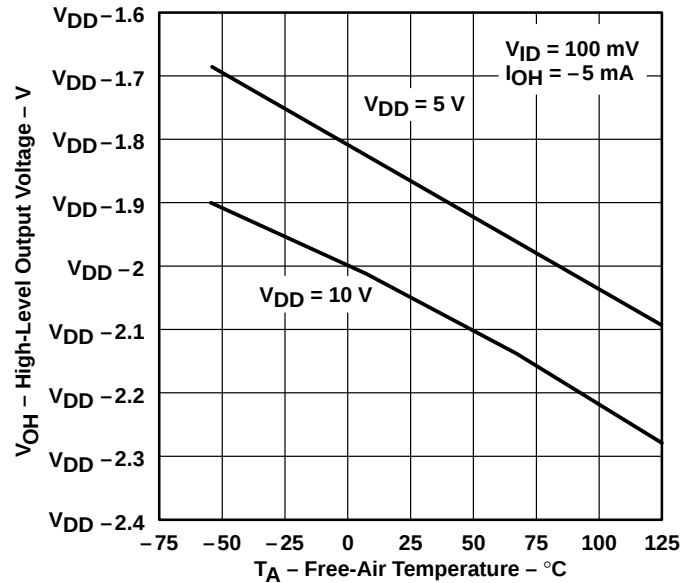


Figure 12

LOW-LEVEL OUTPUT VOLTAGE  
 vs  
 COMMON-MODE INPUT VOLTAGE

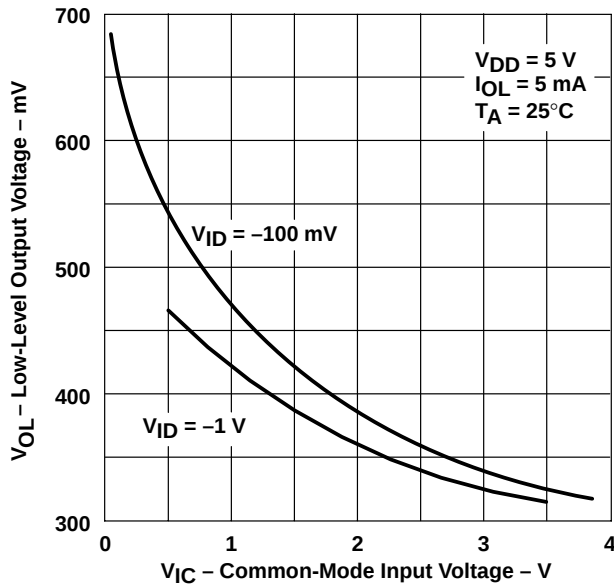


Figure 13

LOW-LEVEL OUTPUT VOLTAGE  
 vs  
 COMMON-MODE INPUT VOLTAGE

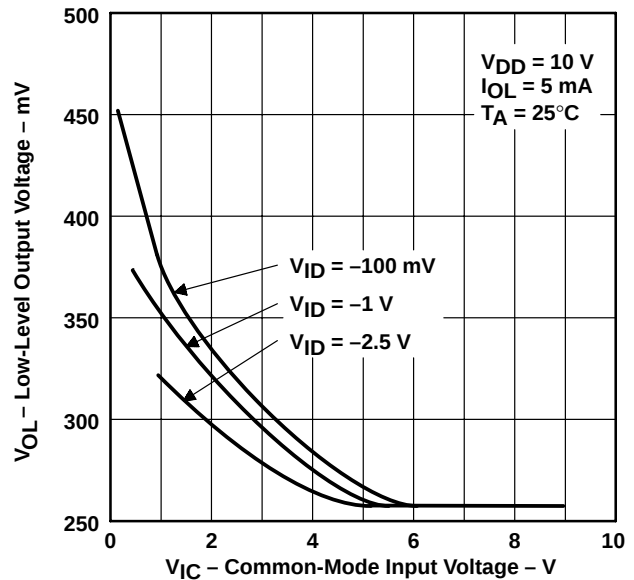


Figure 14

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

## TYPICAL CHARACTERISTICS

LOW-LEVEL OUTPUT VOLTAGE  
vs  
DIFFERENTIAL INPUT VOLTAGE

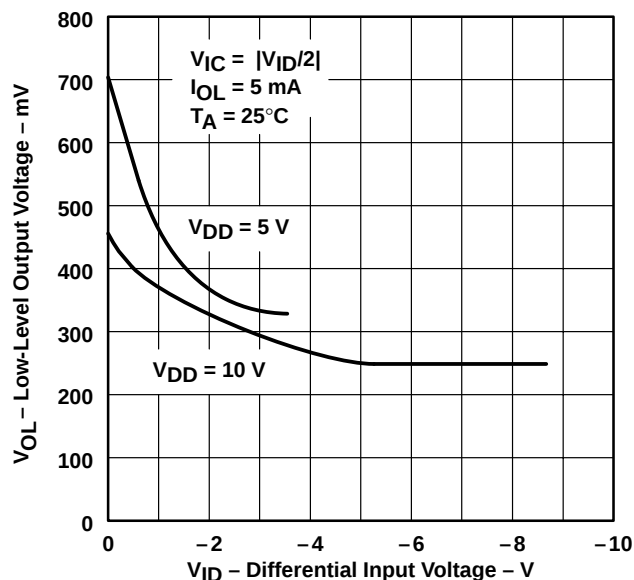


Figure 15

LOW-LEVEL OUTPUT VOLTAGE†  
vs  
FREE-AIR TEMPERATURE

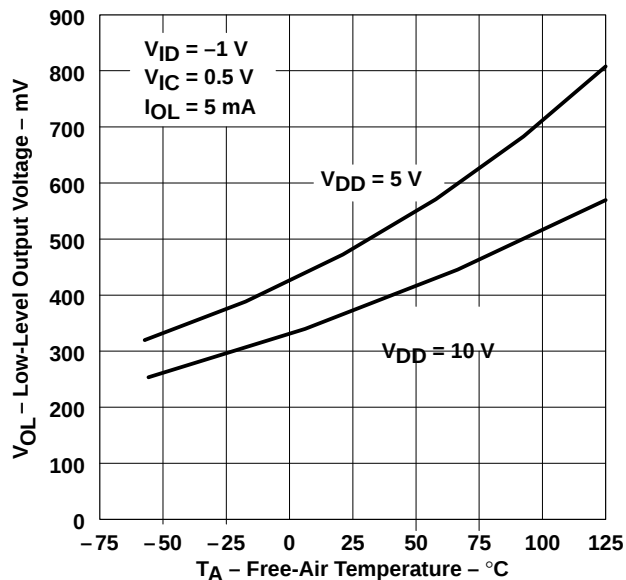


Figure 16

LOW-LEVEL OUTPUT VOLTAGE  
vs  
LOW-LEVEL OUTPUT CURRENT

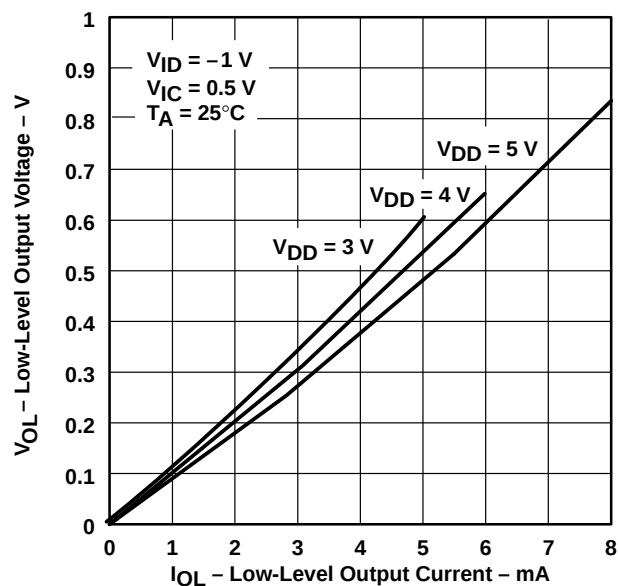


Figure 17

LOW-LEVEL OUTPUT VOLTAGE  
vs  
LOW-LEVEL OUTPUT CURRENT

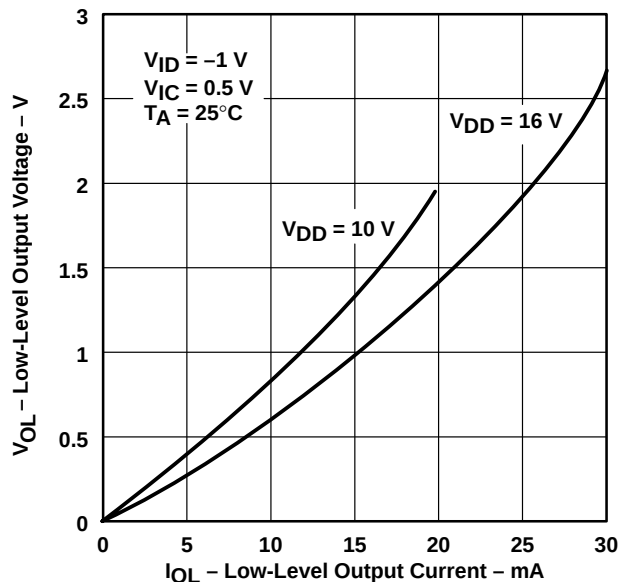


Figure 18

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

## TYPICAL CHARACTERISTICS

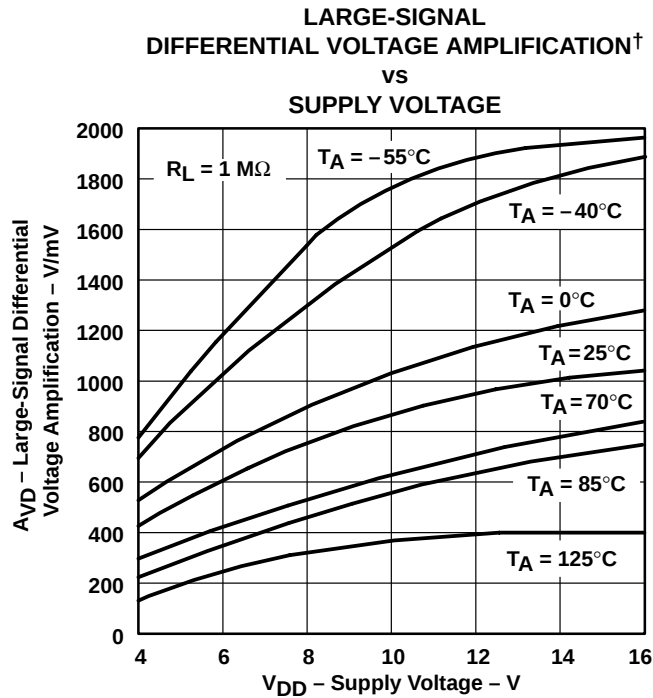


Figure 19

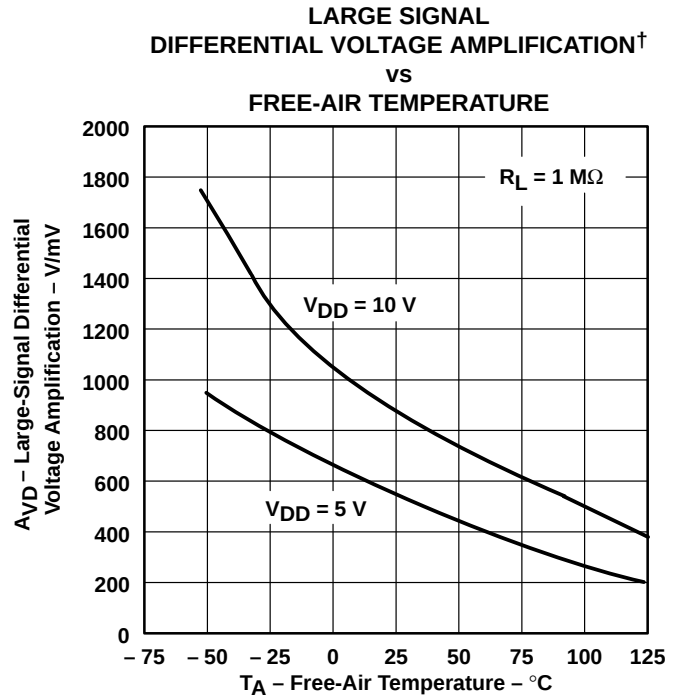


Figure 20

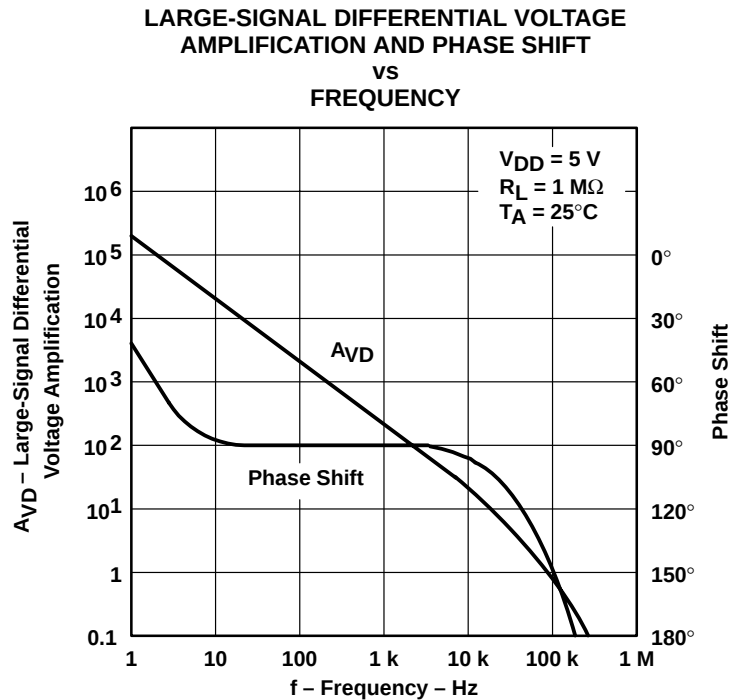


Figure 21

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

# TLC1078, TLC1078Y, TLC1079, TLC1079Y

## LinCMOS™ $\mu$ POWER PRECISION

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#### TYPICAL CHARACTERISTICS

##### LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT VS FREQUENCY

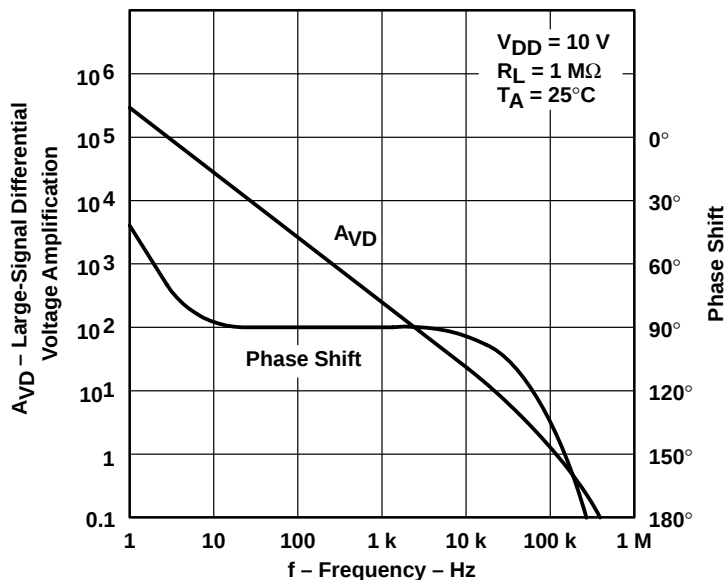


Figure 22

##### MAXIMUM PEAK OUTPUT VOLTAGE VS FREQUENCY

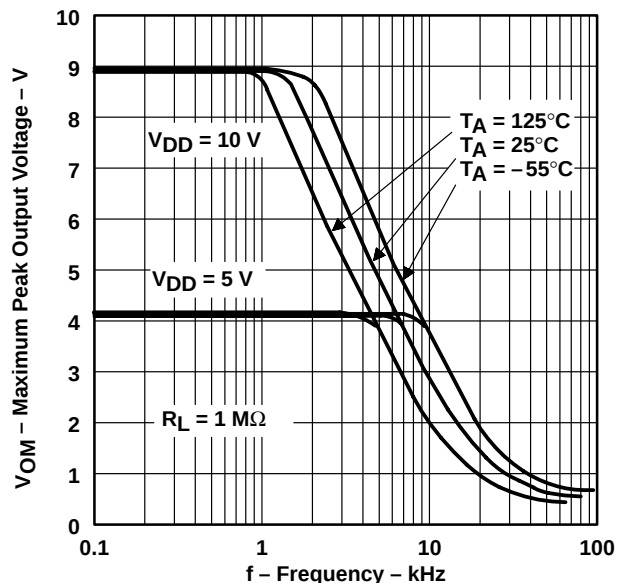


Figure 23

##### SUPPLY CURRENT† VS SUPPLY VOLTAGE

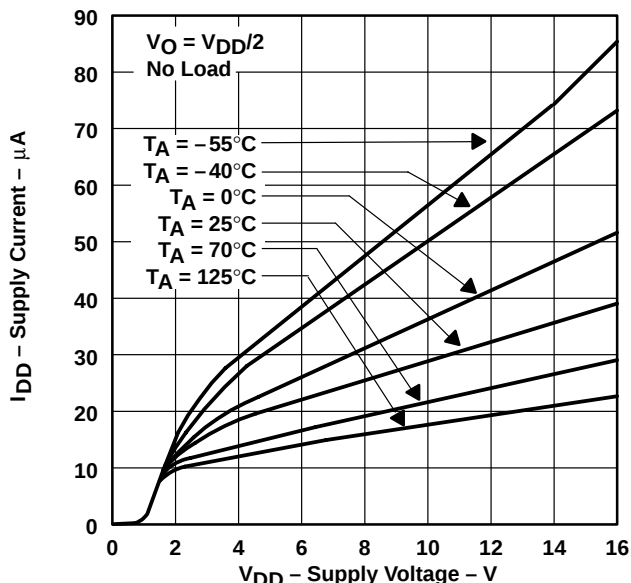


Figure 24

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

## TYPICAL CHARACTERISTICS

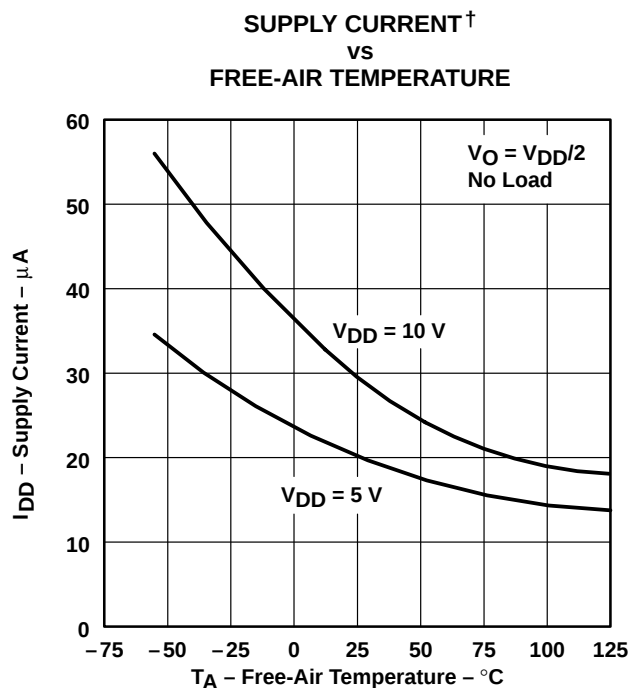


Figure 25

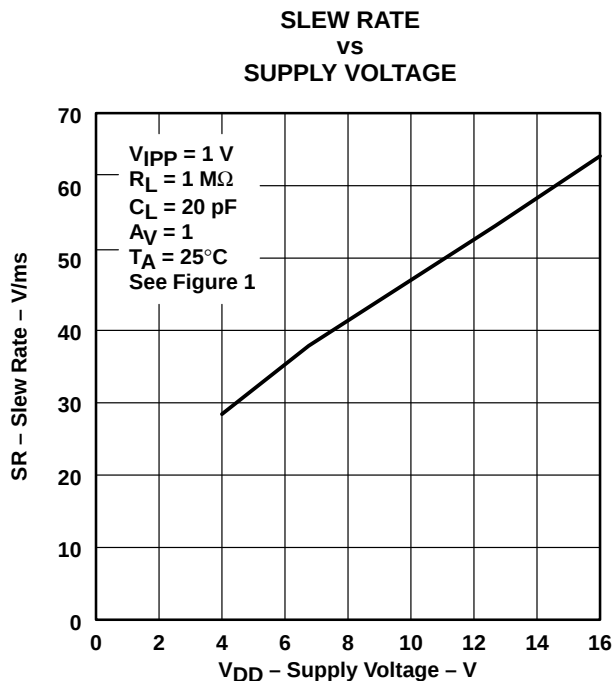


Figure 26

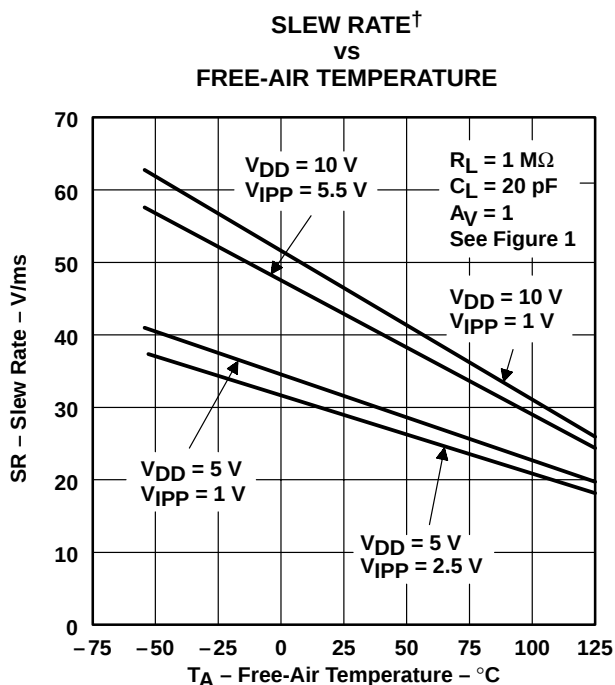


Figure 27

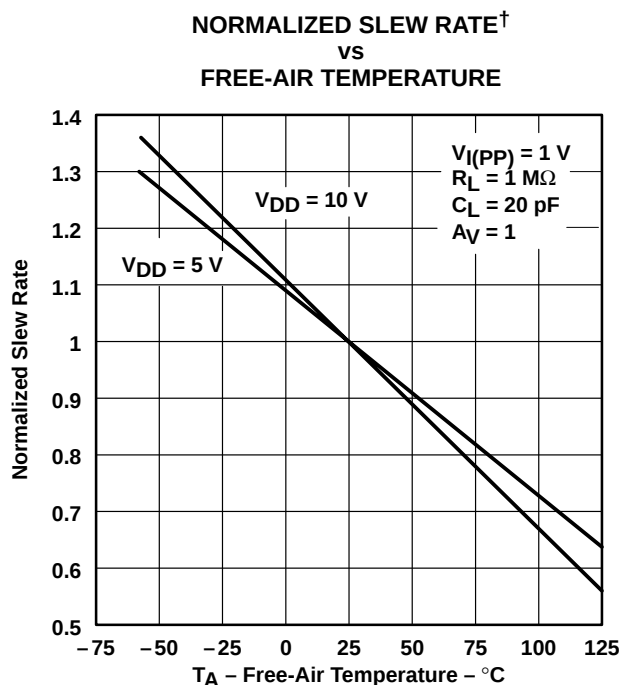


Figure 28

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

## TYPICAL CHARACTERISTICS

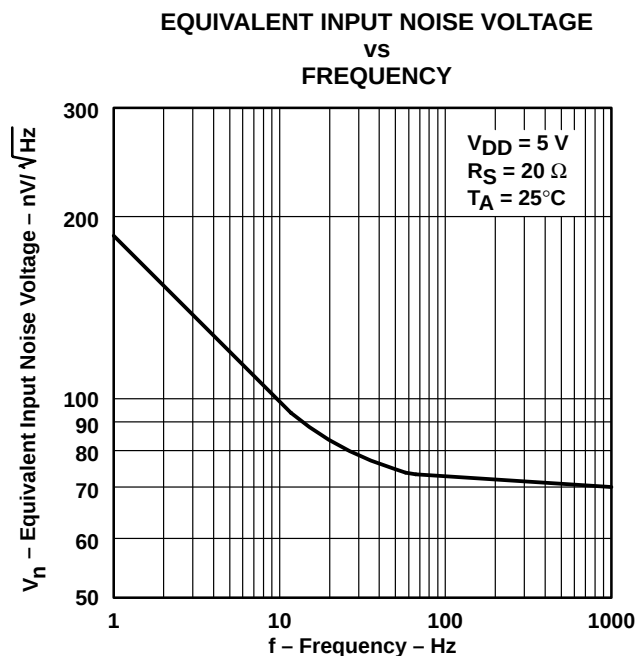


Figure 29

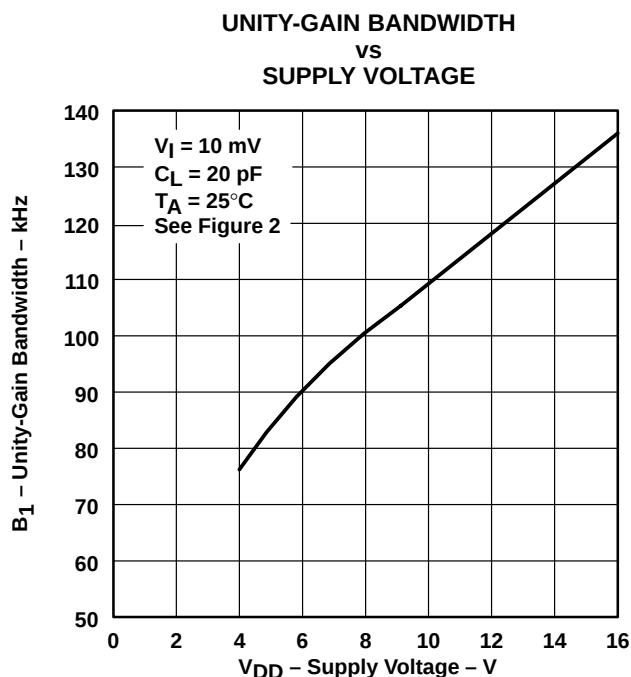


Figure 30

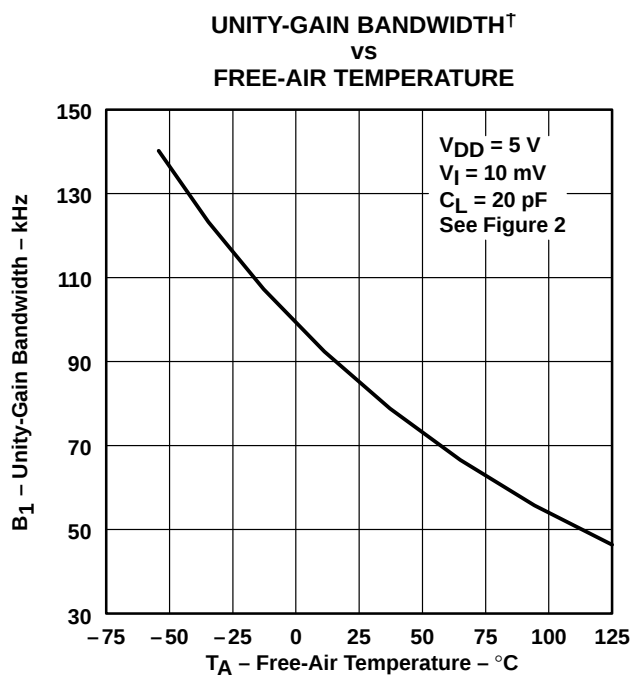


Figure 31

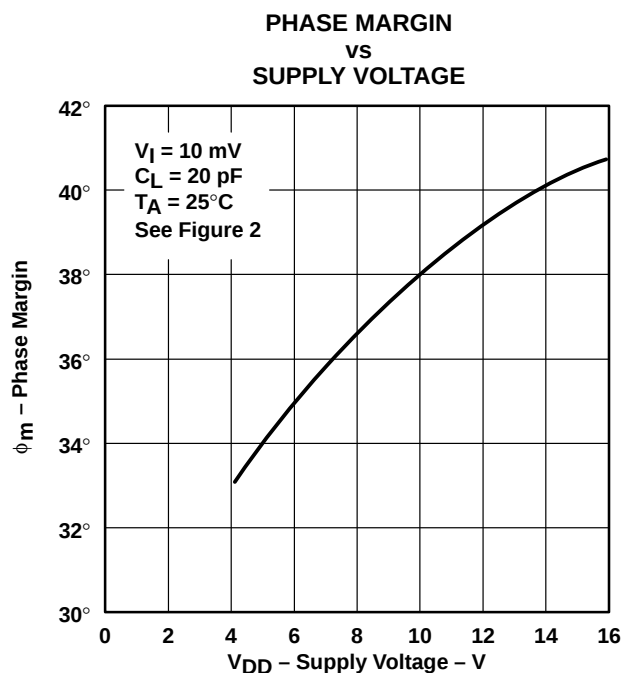


Figure 32

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

## TYPICAL CHARACTERISTICS

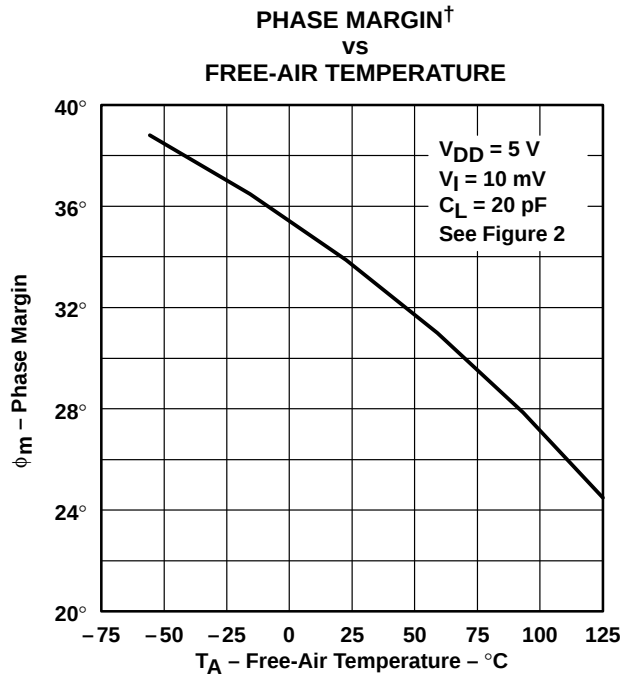


Figure 33

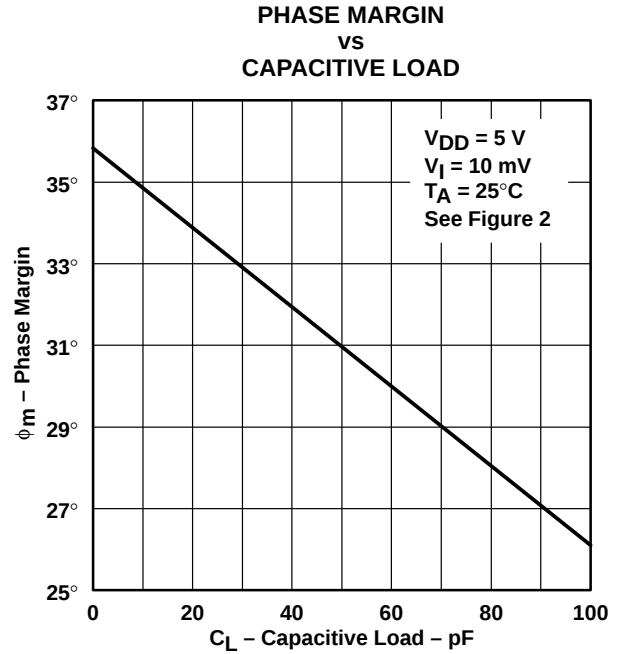


Figure 34

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

**PACKAGING INFORMATION**

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| TLC1078CD        | ACTIVE                | SOIC         | D               | 8    | 75          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| TLC1078CDG4      | ACTIVE                | SOIC         | D               | 8    | 75          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| TLC1078CDR       | ACTIVE                | SOIC         | D               | 8    | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| TLC1078CDRG4     | ACTIVE                | SOIC         | D               | 8    | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| TLC1078CP        | ACTIVE                | PDIP         | P               | 8    | 50          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| TLC1078CPE4      | ACTIVE                | PDIP         | P               | 8    | 50          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| TLC1078ID        | ACTIVE                | SOIC         | D               | 8    | 75          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| TLC1078IDG4      | ACTIVE                | SOIC         | D               | 8    | 75          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| TLC1078IDR       | ACTIVE                | SOIC         | D               | 8    | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| TLC1078IDRG4     | ACTIVE                | SOIC         | D               | 8    | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| TLC1078IP        | ACTIVE                | PDIP         | P               | 8    | 50          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| TLC1078IPE4      | ACTIVE                | PDIP         | P               | 8    | 50          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| TLC1078MD        | ACTIVE                | SOIC         | D               | 8    | 75          | TBD                     | CU NIPDAU        | Level-1-220C-UNLIM           |
| TLC1078MDG4      | ACTIVE                | SOIC         | D               | 8    | 75          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| TLC1079CD        | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| TLC1079CDG4      | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| TLC1079CDR       | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| TLC1079CDRG4     | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| TLC1079CN        | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| TLC1079CNE4      | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| TLC1079CNSR      | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| TLC1079CNSRG4    | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| TLC1079ID        | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| TLC1079IDG4      | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| TLC1079IDR       | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| TLC1079IDRG4     | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| TLC1079IN        | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| TLC1079INE4      | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |

<sup>(1)</sup> 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.

**OBSELETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

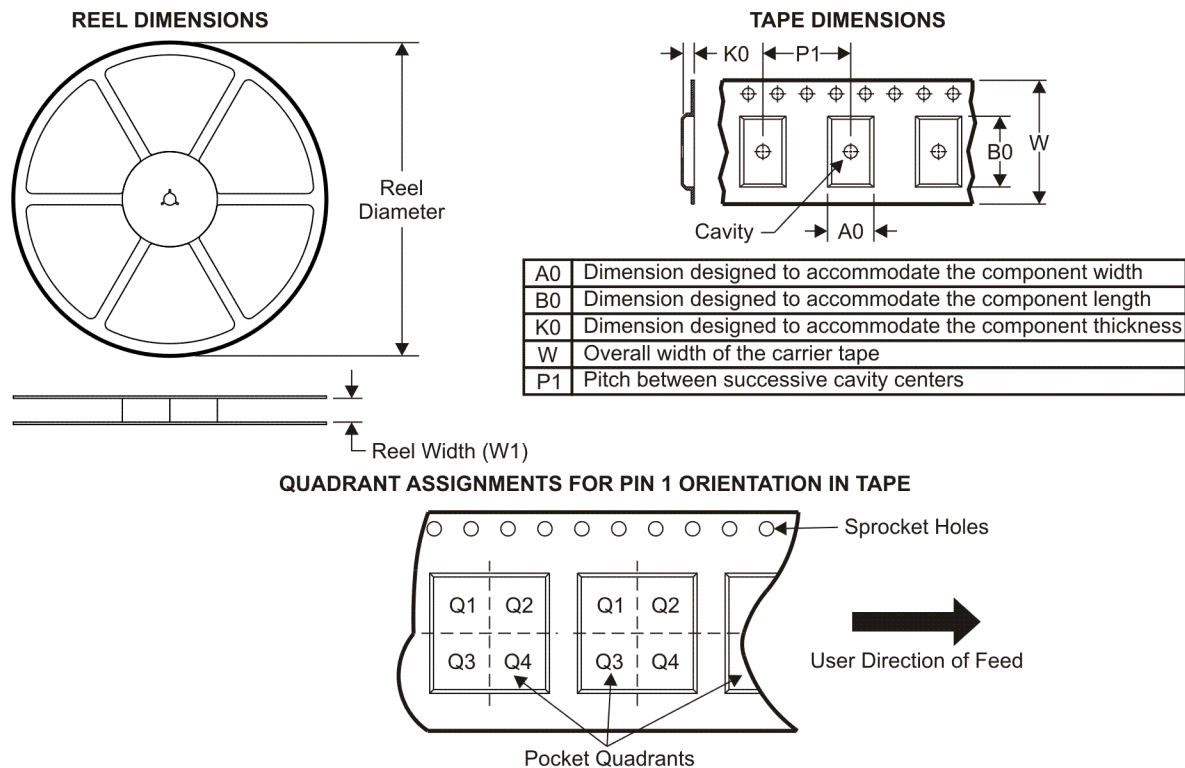
**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

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**TAPE AND REEL INFORMATION**


\*All dimensions are nominal

| Device      | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| TLC1078CDR  | SOIC         | D               | 8    | 2500 | 330.0              | 12.4               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |
| TLC1078IDR  | SOIC         | D               | 8    | 2500 | 330.0              | 12.4               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |
| TLC1078IDR  | SOIC         | D               | 8    | 2500 | 330.0              | 12.4               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |
| TLC1079CDR  | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| TLC1079CNSR | SO           | NS              | 14   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |
| TLC1079IDR  | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device      | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-------------|--------------|-----------------|------|------|-------------|------------|-------------|
| TLC1078CDR  | SOIC         | D               | 8    | 2500 | 340.5       | 338.1      | 20.6        |
| TLC1078IDR  | SOIC         | D               | 8    | 2500 | 346.0       | 346.0      | 29.0        |
| TLC1078IDR  | SOIC         | D               | 8    | 2500 | 340.5       | 338.1      | 20.6        |
| TLC1079CDR  | SOIC         | D               | 14   | 2500 | 346.0       | 346.0      | 33.0        |
| TLC1079CNSR | SO           | NS              | 14   | 2000 | 346.0       | 346.0      | 33.0        |
| TLC1079IDR  | SOIC         | D               | 14   | 2500 | 346.0       | 346.0      | 33.0        |

P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE PACKAGE



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

N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



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



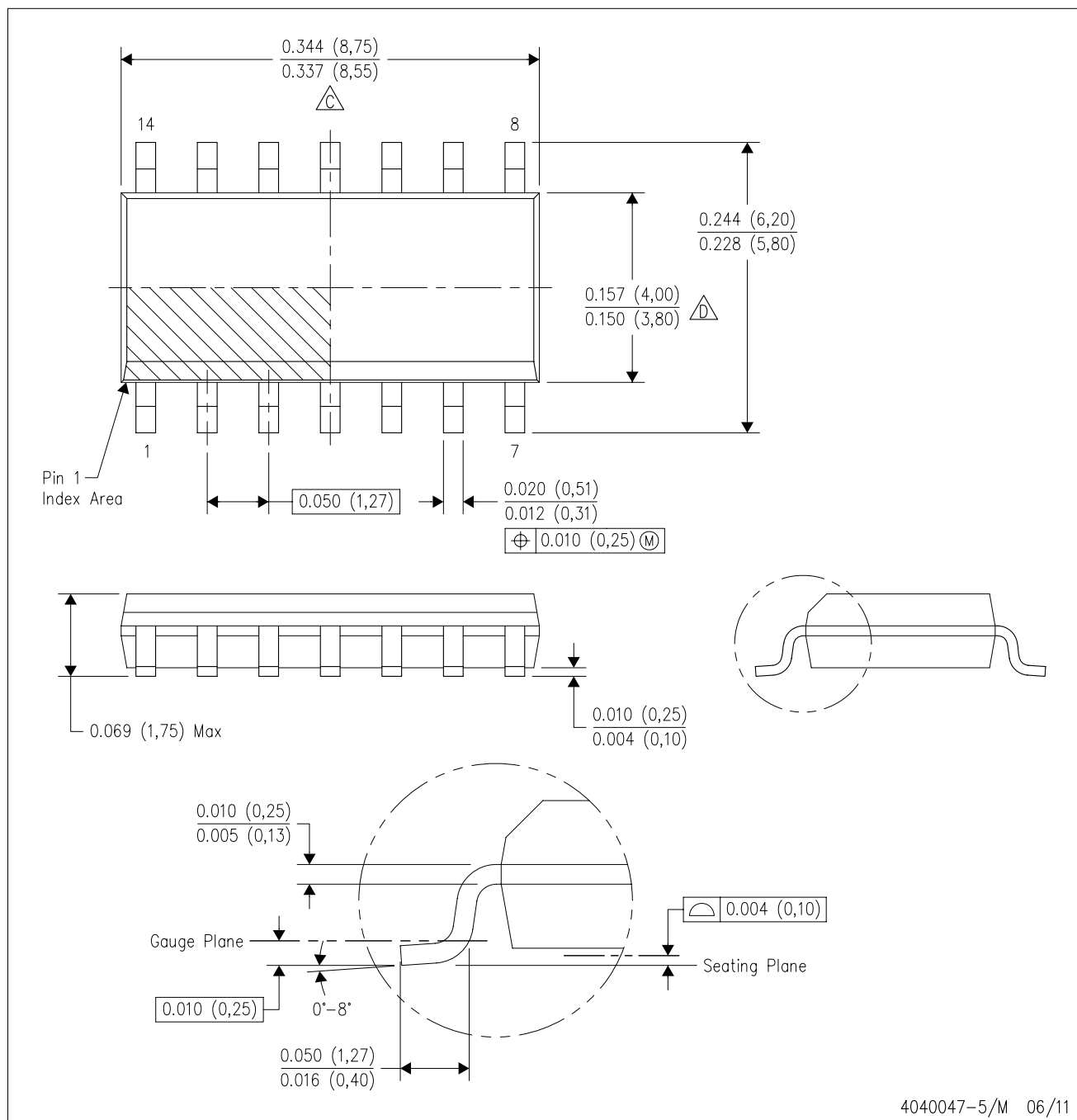
4040049/E 12/2002

NOTES:

- A. All linear dimensions are in inches (millimeters).  
B. This drawing is subject to change without notice.
-  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.

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE

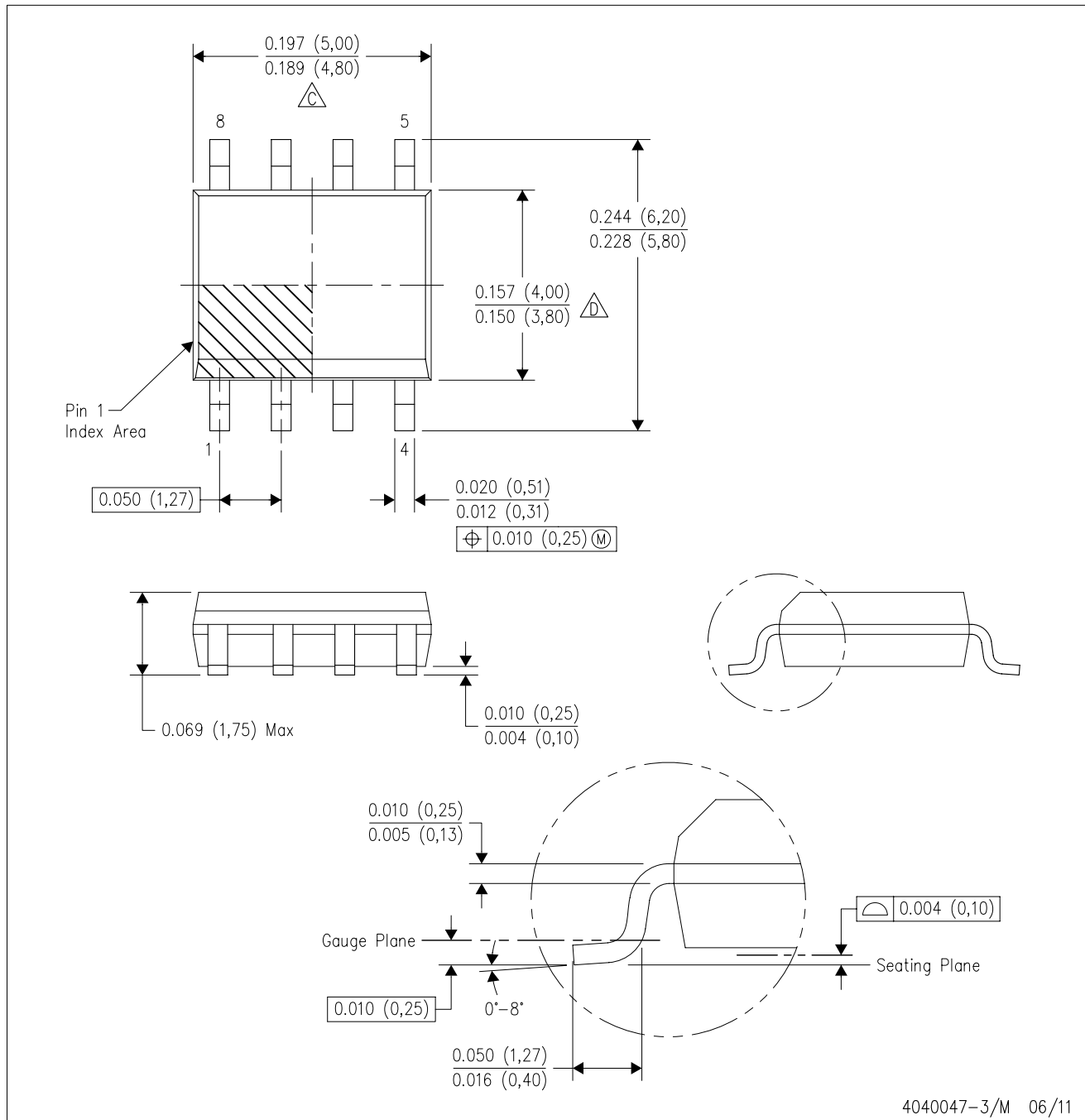


## NOTES:

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

D (R-PDSO-G8)

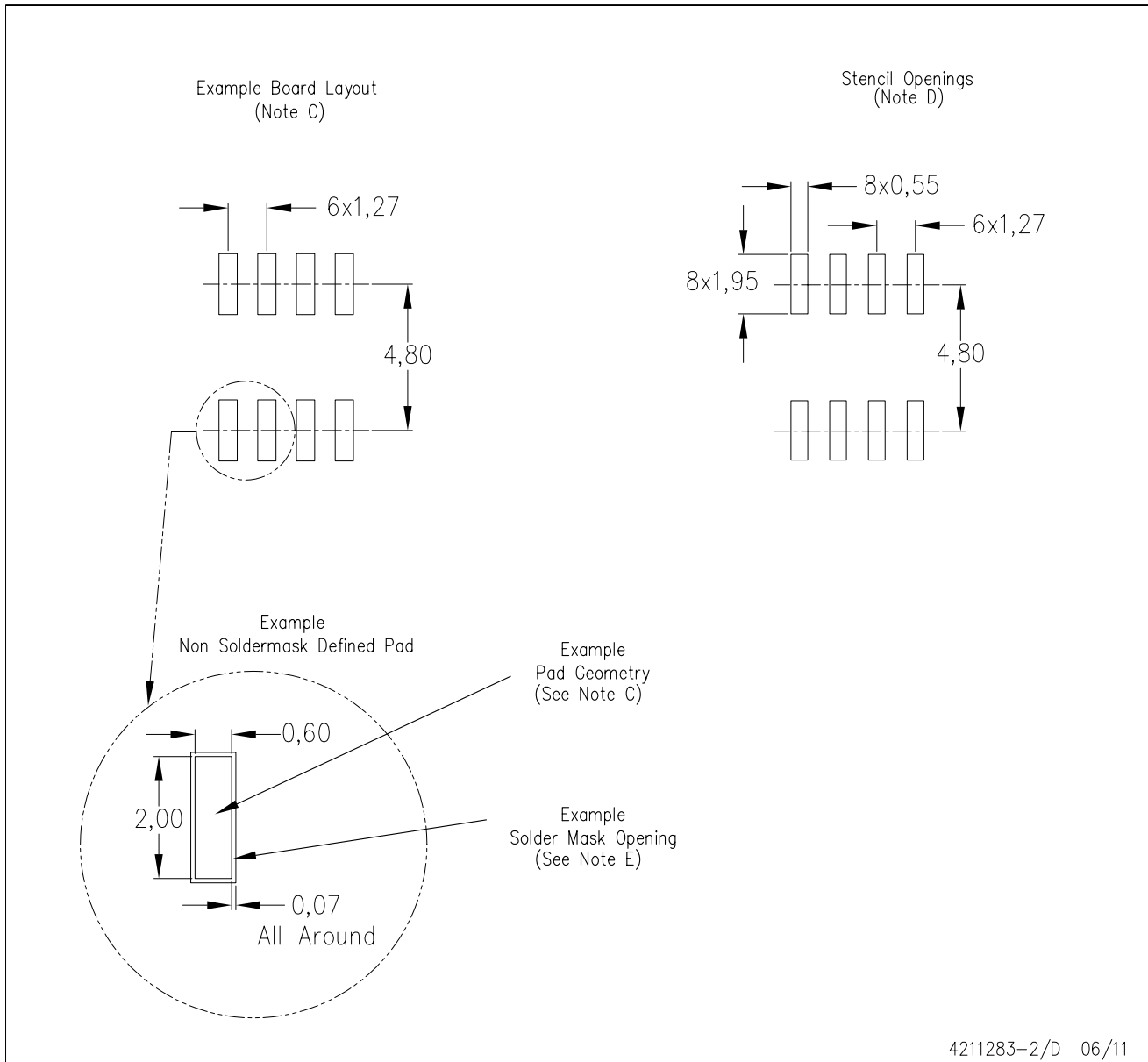
PLASTIC SMALL OUTLINE



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

D (R-PDSO-G8)

PLASTIC SMALL OUTLINE



4211283-2/D 06/11

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

# MECHANICAL DATA

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

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



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

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