

## TL08xx JFET-Input Operational Amplifiers

Check for Samples: [TL081](#), [TL081A](#), [TL081B](#), [TL082](#), [TL082A](#), [TL082B](#), [TL084](#), [TL084A](#), [TL084B](#)

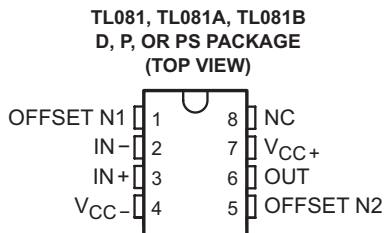
### FEATURES

- **Low Power Consumption:** 1.4 mA/ch Typ
- **Wide Common-Mode and Differential Voltage Ranges**
- **Low Input Bias Current:** 30 pA Typ
- **Low Input Offset Current:** 5 pA Typ
- **Output Short-Circuit Protection**
- **Low Total Harmonic Distortion:** 0.003% Typ
- **High Input Impedance:** JFET Input Stage
- **Latch-Up-Free Operation**
- **High Slew Rate:** 13 V/ $\mu$ s Typ
- **Common-Mode Input Voltage Range Includes  $V_{CC+}$**

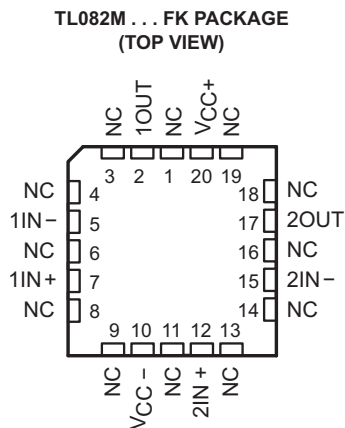
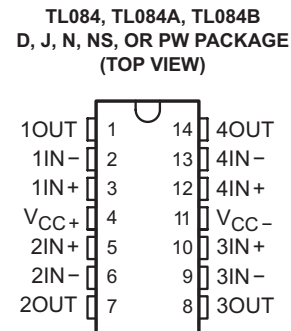
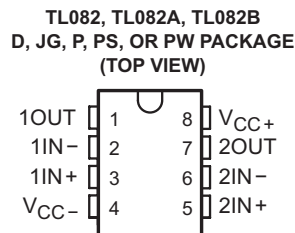
### DESCRIPTION

The TL08xx JFET-input operational amplifier family is designed to offer a wider selection than any previously developed operational amplifier family. Each of these JFET-input operational amplifiers incorporates well-matched, high-voltage JFET and bipolar transistors in a monolithic integrated circuit. The devices feature high slew rates, low input bias and offset currents, and low offset-voltage temperature coefficient. Offset adjustment and external compensation options are available within the TL08x family.

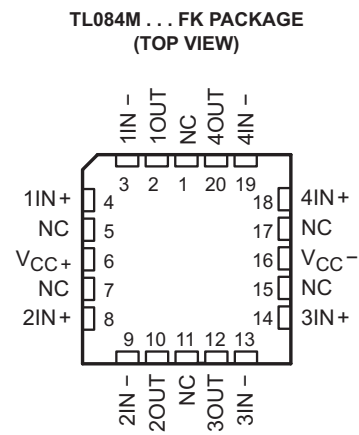
The C-suffix devices are characterized for operation from 0°C to 70°C. The I-suffix devices are characterized for operation from –40°C to 85°C. The Q-suffix devices are characterized for operation from –40°C to 125°C. The M-suffix devices are characterized for operation over the full military temperature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



NC – No internal connection



NC – No internal connection



NC – No internal connection



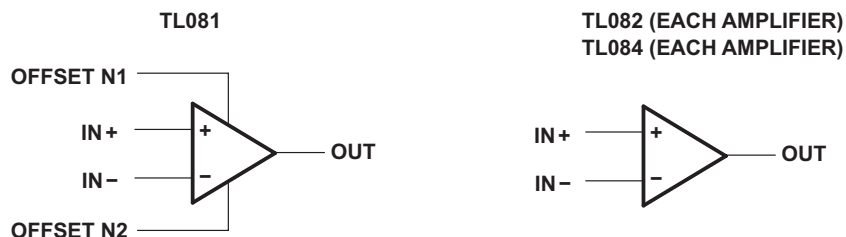
Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.



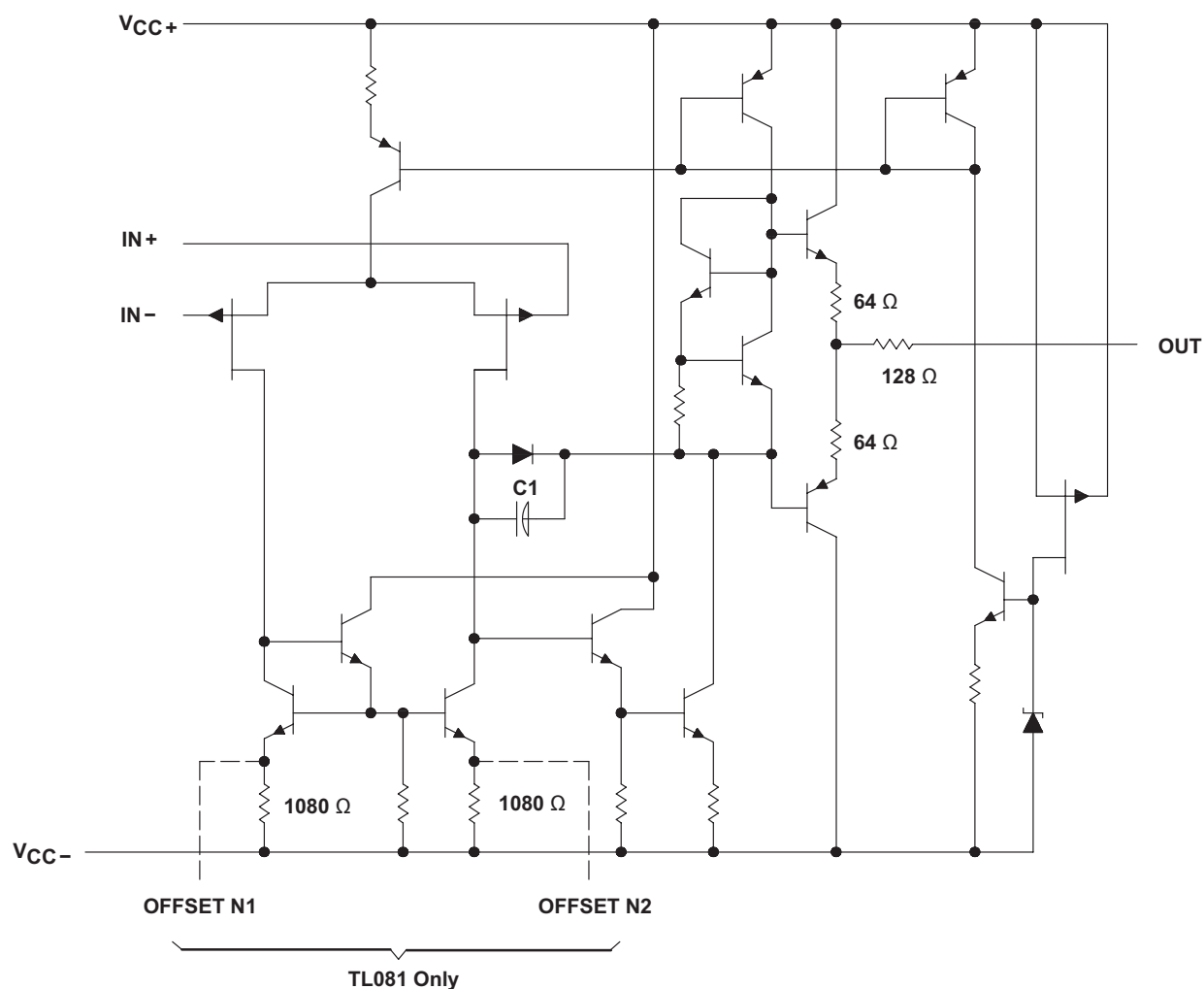
This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

## Symbols



## Schematic (Each Amplifier)



Component values shown are nominal.

## Absolute Maximum Ratings<sup>(1)</sup>

over operating free-air temperature range (unless otherwise noted)

|                  |                                                              | TL08_C<br>TL08_AC<br>TL08_BC | TL08_I     | TL084Q     | TL08_M     | UNIT |
|------------------|--------------------------------------------------------------|------------------------------|------------|------------|------------|------|
| V <sub>CC+</sub> | Supply voltage <sup>(2)</sup>                                | 18                           | 18         | 18         | 18         | V    |
| V <sub>CC-</sub> |                                                              | –18                          | –18        | –18        | –18        |      |
| V <sub>ID</sub>  | Differential input voltage <sup>(3)</sup>                    | ±30                          | ±30        | ±30        | ±30        | V    |
| V <sub>I</sub>   | Input voltage <sup>(2) (4)</sup>                             | ±15                          | ±15        | ±15        | ±15        | V    |
|                  | Duration of output short circuit <sup>(5)</sup>              | Unlimited                    | Unlimited  | Unlimited  | Unlimited  |      |
|                  | Continuous total power dissipation                           | See Dissipation Rating Table |            |            |            |      |
| T <sub>A</sub>   | Operating free-air temperature range                         | 0 to 70                      | –40 to 85  | –40 to 125 | –55 to 125 | °C   |
| θ <sub>JA</sub>  | Package thermal impedance <sup>(6) (7)</sup>                 | D package (8-pin)            | 97         | 97         | 97         | °C/W |
|                  |                                                              | D package (14-pin)           | 86         | 86         | 86         |      |
|                  |                                                              | N package (14-pin)           | 76         | 76         | 80         |      |
|                  |                                                              | NS package (14-pin)          | 80         |            | 76         |      |
|                  |                                                              | P package                    | 85         | 85         | 85         |      |
|                  |                                                              | PS package                   | 95         | 95         | 95         |      |
|                  |                                                              | PW package (8 pin)           | 149        |            | 149        |      |
|                  |                                                              | PW package (14 pin)          | 113        | 113        | 113        |      |
|                  | Operating virtual junction temperature                       | 150                          | 150        | 150        | 150        | °C   |
| T <sub>C</sub>   | Case temperature for 60 seconds                              | FK package                   |            |            | 260        | °C   |
|                  | Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds | J or JG package              |            |            | 300        | °C   |
| T <sub>stg</sub> | Storage temperature range                                    | –65 to 150                   | –65 to 150 | –65 to 150 | –65 to 150 | °C   |

- (1) 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.
- (2) All voltage values, except differential voltages, are with respect to the midpoint between V<sub>CC+</sub> and V<sub>CC-</sub>.
- (3) Differential voltages are at IN+, with respect to IN–.
- (4) The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 V, whichever is less.
- (5) The output may be shorted to ground or to either supply. Temperature and/or supply voltages must be limited to ensure that the dissipation rating is not exceeded.
- (6) Maximum power dissipation is a function of T<sub>J(max)</sub>, θ<sub>JA</sub>, and T<sub>A</sub>. The maximum allowable power dissipation at any allowable ambient temperature is P<sub>D</sub> = (T<sub>J(max)</sub> – T<sub>A</sub>)/θ<sub>JA</sub>. Operating at the absolute maximum T<sub>J</sub> of 150°C can affect reliability.
- (7) The package thermal impedance is calculated in accordance with JESD 51-7.

**Dissipation Rating Table**

| PACKAGE    | T <sub>A</sub> ≤ 25°C<br>POWER RATING | DERATING<br>FACTOR | DERATE<br>ABOVE T <sub>A</sub> | T <sub>A</sub> = 70°C<br>POWER RATING | T <sub>A</sub> = 85°C<br>POWER RATING | T <sub>A</sub> = 125°C<br>POWER RATING |
|------------|---------------------------------------|--------------------|--------------------------------|---------------------------------------|---------------------------------------|----------------------------------------|
| D (14 pin) | 680 mW                                | 7.6 mW/°C          | 60°C                           | 604 mW                                | 490 mW                                | 186 mW                                 |
| FK         | 680 mW                                | 11.0 mW/°C         | 88°C                           | 680 mW                                | 680 mW                                | 273 mW                                 |
| J          | 680 mW                                | 11.0 mW/°C         | 88°C                           | 680 mW                                | 680 mW                                | 273 mW                                 |
| JG         | 680 mW                                | 8.4 mW/°C          | 69°C                           | 672 mW                                | 546 mW                                | 210 mW                                 |

## Electrical Characteristics

$V_{CC\pm} = \pm 15\text{ V}$  (unless otherwise noted)

| PARAMETER                        |                                                                       | TEST CONDITIONS                                                                         | T <sub>A</sub> <sup>(1)</sup> | TL081C<br>TL082C<br>TL084C |     |           | TL081AC<br>TL082AC<br>TL084AC |     |           | TL081BC<br>TL082BC<br>TL084BC |     |           | TL081I<br>TL082I<br>TL084I |     |           | UNIT  |
|----------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------|----------------------------|-----|-----------|-------------------------------|-----|-----------|-------------------------------|-----|-----------|----------------------------|-----|-----------|-------|
|                                  |                                                                       |                                                                                         |                               | MIN                        | TYP | MAX       | MIN                           | TYP | MAX       | MIN                           | TYP | MAX       | MIN                        | TYP | MAX       |       |
| V <sub>IO</sub>                  | Input offset voltage                                                  | V <sub>O</sub> = 0,<br>R <sub>S</sub> = 50 Ω                                            | 25°C                          | 3                          |     | 15        | 3                             |     | 6         | 2                             |     | 3         | 3                          |     | 6         | mV    |
|                                  |                                                                       |                                                                                         | Full range                    |                            |     | 20        |                               |     | 7.5       |                               |     | 5         |                            |     | 9         |       |
| α <sub>VIO</sub>                 | Temperature coefficient of input offset voltage                       | V <sub>O</sub> = 0,<br>R <sub>S</sub> = 50 Ω                                            | Full range                    | 18                         |     |           | 18                            |     |           | 18                            |     |           | 18                         |     |           | μV/°C |
| I <sub>IO</sub>                  | Input offset current <sup>(2)</sup>                                   | V <sub>O</sub> = 0                                                                      | 25°C                          | 5                          |     | 200       | 5                             |     | 100       | 5                             |     | 100       | 5                          |     | 100       | pA    |
|                                  |                                                                       |                                                                                         | Full range                    |                            |     | 2         |                               |     | 2         |                               |     | 2         |                            |     | 10        | nA    |
| I <sub>IB</sub>                  | Input bias current <sup>(2)</sup>                                     | V <sub>O</sub> = 0                                                                      | 25°C                          | 30                         |     | 400       | 30                            |     | 200       | 30                            |     | 200       | 30                         |     | 200       | pA    |
|                                  |                                                                       |                                                                                         | Full range                    |                            |     | 10        |                               |     | 7         |                               |     | 7         |                            |     | 20        | nA    |
| V <sub>ICR</sub>                 | Common-mode input voltage range                                       |                                                                                         | 25°C                          | ±11                        |     | −12 to 15 | ±11                           |     | −12 to 15 | ±11                           |     | −12 to 15 | ±11                        |     | −12 to 15 | V     |
| V <sub>OM</sub>                  | Maximum peak output voltage swing                                     | R <sub>L</sub> = 10 kΩ                                                                  | 25°C                          | ±12                        |     | ±13.5     | ±12                           |     | ±13.5     | ±12                           |     | ±13.5     | ±12                        |     | ±13.5     | V     |
|                                  |                                                                       | R <sub>L</sub> ≥ 10 kΩ                                                                  | Full range                    | ±12                        |     |           | ±12                           |     |           | ±12                           |     |           | ±12                        |     |           |       |
|                                  |                                                                       | R <sub>L</sub> ≥ 2 kΩ                                                                   |                               | ±10                        |     | ±12       | ±10                           |     | ±12       | ±10                           |     | ±12       | ±10                        |     | ±12       |       |
| A <sub>VD</sub>                  | Large-signal differential voltage amplification                       | V <sub>O</sub> = ±10 V,<br>R <sub>L</sub> ≥ 2 kΩ                                        | 25°C                          | 25                         |     | 200       | 50                            |     | 200       | 50                            |     | 200       | 50                         |     | 200       | V/mV  |
|                                  |                                                                       |                                                                                         | Full range                    | 15                         |     |           | 15                            |     |           | 25                            |     |           | 25                         |     |           |       |
| B <sub>1</sub>                   | Unity-gain bandwidth                                                  |                                                                                         | 25°C                          | 3                          |     |           | 3                             |     |           | 3                             |     |           | 3                          |     |           | MHz   |
| r <sub>i</sub>                   | Input resistance                                                      |                                                                                         | 25°C                          | 10 <sup>12</sup>           |     |           | 10 <sup>12</sup>              |     |           | 10 <sup>12</sup>              |     |           | 10 <sup>12</sup>           |     |           | Ω     |
| CMRR                             | Common-mode rejection ratio                                           | V <sub>IC</sub> = V <sub>ICRmin</sub> ,<br>V <sub>O</sub> = 0,<br>R <sub>S</sub> = 50 Ω | 25°C                          | 70                         |     | 86        | 75                            |     | 86        | 75                            |     | 86        | 75                         |     | 86        | dB    |
| k <sub>SVR</sub>                 | Supply-voltage rejection ratio (ΔV <sub>CC±</sub> /ΔV <sub>IO</sub> ) | V <sub>CC</sub> = ±15 V to ±9 V,<br>V <sub>O</sub> = 0,<br>R <sub>S</sub> = 50 Ω        | 25°C                          | 70                         |     | 86        | 80                            |     | 86        | 80                            |     | 86        | 80                         |     | 86        | dB    |
| I <sub>CC</sub>                  | Supply current (each amplifier)                                       | V <sub>O</sub> = 0,<br>No load                                                          | 25°C                          | 1.4                        |     | 2.8       | 1.4                           |     | 2.8       | 1.4                           |     | 2.8       | 1.4                        |     | 2.8       | mA    |
| V <sub>O1</sub> /V <sub>O2</sub> | Crosstalk attenuation                                                 | A <sub>VD</sub> = 100                                                                   | 25°C                          | 120                        |     |           | 120                           |     |           | 120                           |     |           | 120                        |     |           | dB    |

- (1) All characteristics are measured under open-loop conditions with zero common-mode voltage, unless otherwise specified. Full range for  $T_A$  is 0°C to 70°C for TL08\_C, TL08\_AC, TL08\_BC and –40°C to 85°C for TL08\_I.
- (2) Input bias currents of an FET-input operational amplifier are normal junction reverse currents, which are temperature sensitive, as shown in Figure 17. Pulse techniques must be used that maintain the junction temperature as close to the ambient temperature as possible.

## Electrical Characteristics

 $V_{CC\pm} = \pm 15\text{ V}$  (unless otherwise noted)

| PARAMETER                        |                                                                       | TEST CONDITIONS <sup>(1)</sup>                                                       | T <sub>A</sub> | TL081M, TL082M   |     |     | TL084Q, TL084M   |     |     | UNIT  |
|----------------------------------|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------|----------------|------------------|-----|-----|------------------|-----|-----|-------|
|                                  |                                                                       |                                                                                      |                | MIN              | TYP | MAX | MIN              | TYP | MAX |       |
| V <sub>IO</sub>                  | Input offset voltage                                                  | V <sub>O</sub> = 0, R <sub>S</sub> = 50 Ω                                            | 25°C           | 3      6         |     |     | 3      9         |     |     | mV    |
|                                  |                                                                       |                                                                                      | Full range     | 9                |     |     | 15               |     |     |       |
| α <sub>VIO</sub>                 | Temperature coefficient of input offset voltage                       | V <sub>O</sub> = 0, R <sub>S</sub> = 50 Ω                                            | Full range     | 18               |     |     | 18               |     |     | μV/°C |
| I <sub>IO</sub>                  | Input offset current <sup>(2)</sup>                                   | V <sub>O</sub> = 0                                                                   | 25°C           | 5      100       |     |     | 5      100       |     |     | pA    |
|                                  |                                                                       |                                                                                      | 125°C          | 20               |     |     | 20               |     |     | nA    |
| I <sub>IB</sub>                  | Input bias current <sup>(2)</sup>                                     | V <sub>O</sub> = 0                                                                   | 25°C           | 30      200      |     |     | 30      200      |     |     | pA    |
|                                  |                                                                       |                                                                                      | 125°C          | 50               |     |     | 50               |     |     | nA    |
| V <sub>ICR</sub>                 | Common-mode input voltage range                                       |                                                                                      | 25°C           | ±11    –12 to 15 |     |     | ±11    –12 to 15 |     |     | V     |
| V <sub>OM</sub>                  | Maximum peak output voltage swing                                     | R <sub>L</sub> = 10 kΩ                                                               | 25°C           | ±12    ±13.5     |     |     | ±12    ±13.5     |     |     | V     |
|                                  |                                                                       | R <sub>L</sub> ≥ 10 kΩ                                                               | Full range     | ±12              |     |     | ±12              |     |     |       |
|                                  |                                                                       | R <sub>L</sub> ≥ 2 kΩ                                                                |                | ±10    ±12       |     |     | ±10    ±12       |     |     |       |
| A <sub>VD</sub>                  | Large-signal differential voltage amplification                       | V <sub>O</sub> = ±10 V, R <sub>L</sub> ≥ 2 kΩ                                        | 25°C           | 25      200      |     |     | 25      200      |     |     | V/mV  |
|                                  |                                                                       |                                                                                      | Full range     | 15               |     |     | 15               |     |     |       |
| B <sub>1</sub>                   | Unity-gain bandwidth                                                  |                                                                                      | 25°C           | 3                |     |     | 3                |     |     | MHz   |
| r <sub>i</sub>                   | Input resistance                                                      |                                                                                      | 25°C           | 10 <sup>12</sup> |     |     | 10 <sup>12</sup> |     |     | Ω     |
| CMRR                             | Common-mode rejection ratio                                           | V <sub>IC</sub> = V <sub>ICRmin</sub> ,<br>V <sub>O</sub> = 0, R <sub>S</sub> = 50 Ω | 25°C           | 80      86       |     |     | 80      86       |     |     | dB    |
| k <sub>SVR</sub>                 | Supply-voltage rejection ratio (ΔV <sub>CC±</sub> /ΔV <sub>IO</sub> ) | V <sub>CC</sub> = ±15 V to ±9 V,<br>V <sub>O</sub> = 0, R <sub>S</sub> = 50 Ω        | 25°C           | 80      86       |     |     | 80      86       |     |     | dB    |
| I <sub>CC</sub>                  | Supply current (each amplifier)                                       | V <sub>O</sub> = 0, No load                                                          | 25°C           | 1.4      2.8     |     |     | 1.4      2.8     |     |     | mA    |
| V <sub>O1</sub> /V <sub>O2</sub> | Crosstalk attenuation                                                 | A <sub>VD</sub> = 100                                                                | 25°C           | 120              |     |     | 120              |     |     | dB    |

(1) All characteristics are measured under open-loop conditions, with zero common-mode input voltage, unless otherwise specified.

(2) Input bias currents of a FET-input operational amplifier are normal junction reverse currents, which are temperature sensitive, as shown in Figure 17. Pulse techniques must be used that maintain the junction temperatures as close to the ambient temperature as possible.

## Operating Characteristics

 $V_{CC\pm} = \pm 15\text{ V}$ ,  $T_A = 25^\circ\text{C}$  (unless otherwise noted)

| PARAMETER      |                                | TEST CONDITIONS                                                                                                                       |                     | MIN              | TYP | MAX | UNIT   |
|----------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------|-----|-----|--------|
| SR             | Slew rate at unity gain        | V <sub>I</sub> = 10 V, R <sub>L</sub> = 2 kΩ, C <sub>L</sub> = 100 pF, See <a href="#">Figure 1</a>                                   |                     | 8 <sup>(1)</sup> | 13  |     | V/μs   |
|                |                                | V <sub>I</sub> = 10 V, R <sub>L</sub> = 2 kΩ, C <sub>L</sub> = 100 pF, T <sub>A</sub> = − 55°C to 125°C, See <a href="#">Figure 1</a> |                     | 5 <sup>(1)</sup> |     |     |        |
| t <sub>r</sub> | Rise-time                      | V <sub>I</sub> = 20 V, R <sub>L</sub> = 2 kΩ, C <sub>L</sub> = 100 pF, See <a href="#">Figure 1</a>                                   |                     | 0.05             |     |     | μs     |
|                | overshoot factor               |                                                                                                                                       |                     | 20               |     |     | %      |
| V <sub>n</sub> | Equivalent input noise voltage | R <sub>S</sub> = 20 Ω                                                                                                                 | f = 1 kHz           | 18               |     |     | nV/√Hz |
|                |                                |                                                                                                                                       | f = 10 Hz to 10 kHz | 4                |     |     | μV     |
| I <sub>n</sub> | Equivalent input noise current | R <sub>S</sub> = 20 Ω, f = 1 kHz                                                                                                      |                     | 0.01             |     |     | pA/√Hz |
| THD            | Total harmonic distortion      | V <sub>I rms</sub> = 6 V, A <sub>VD</sub> = 1, R <sub>S</sub> ≤ 1 kΩ, R <sub>L</sub> ≥ 2 kΩ, f = 1 kHz,                               |                     | 0.003            |     |     | %      |

(1) On products compliant to MIL-PRF-38535, this parameter is not production tested.

## Parameter Measurement Information

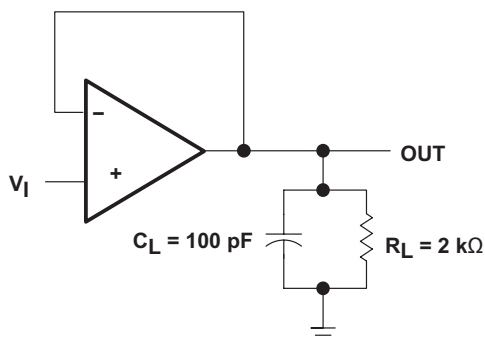


Figure 1.

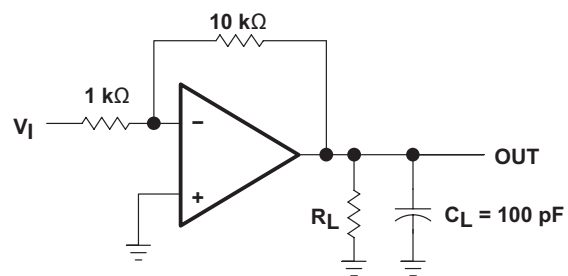


Figure 2.

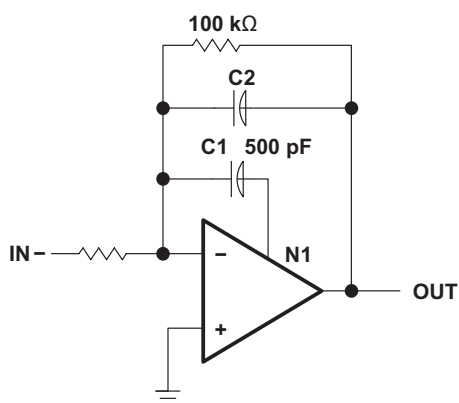


Figure 3.

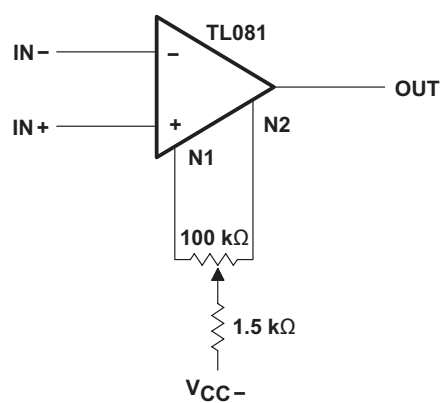


Figure 4.

## Typical Characteristics

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

**Table of Graphs**

|          |                                                 |                                                                                    | Figure                                                            |
|----------|-------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| $V_{OM}$ | Maximum peak output voltage                     | vs Frequency<br>vs Free-air temperature<br>vs Load resistance<br>vs Supply voltage | Figure 5, Figure 6, Figure 7<br>Figure 8<br>Figure 9<br>Figure 10 |
| $A_{VD}$ | Large-signal differential voltage amplification | vs Free-air temperature<br>vs Load resistance                                      | Figure 11<br>Figure 12                                            |
|          | Differential voltage amplification              | vs Frequency with feed-forward compensation                                        | Figure 13                                                         |
| $P_D$    | Total power dissipation                         | vs Free-air temperature                                                            | Figure 14                                                         |
| $I_{CC}$ | Supply current                                  | vs Free-air temperature<br>vs Supply voltage                                       | Figure 15<br>Figure 16                                            |
|          | Input bias current                              | vs Free-air temperature                                                            | Figure 17                                                         |
|          | Large-signal pulse response                     | vs Time                                                                            | Figure 18                                                         |
| $V_O$    | Output voltage                                  | vs Elapsed time                                                                    | Figure 19                                                         |
| CMRR     | Common-mode rejection ratio                     | vs Free-air temperature                                                            | Figure 20                                                         |
| $V_n$    | Equivalent input noise voltage                  | vs Frequency                                                                       | Figure 21                                                         |
| THD      | Total harmonic distortion                       | vs Frequency                                                                       | Figure 22                                                         |

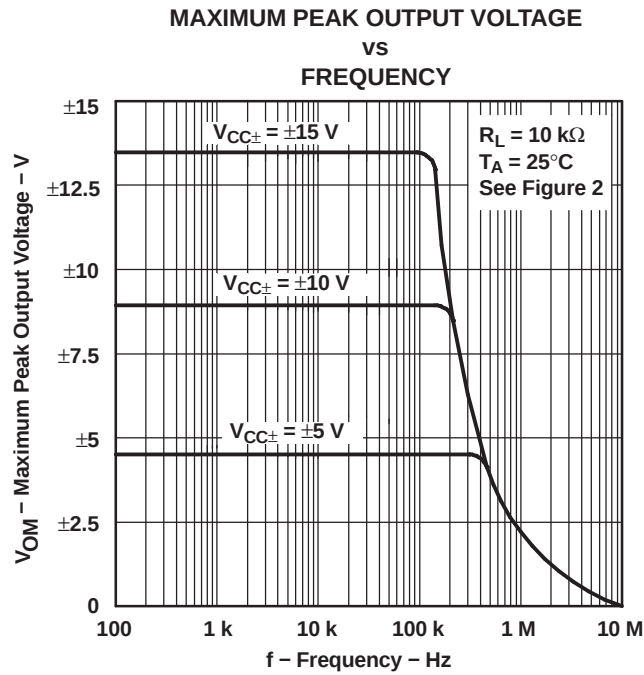


Figure 5.

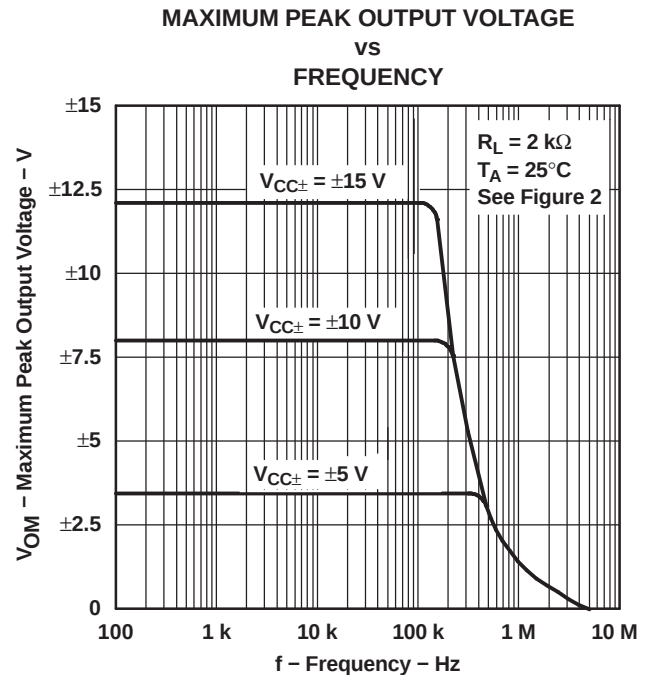
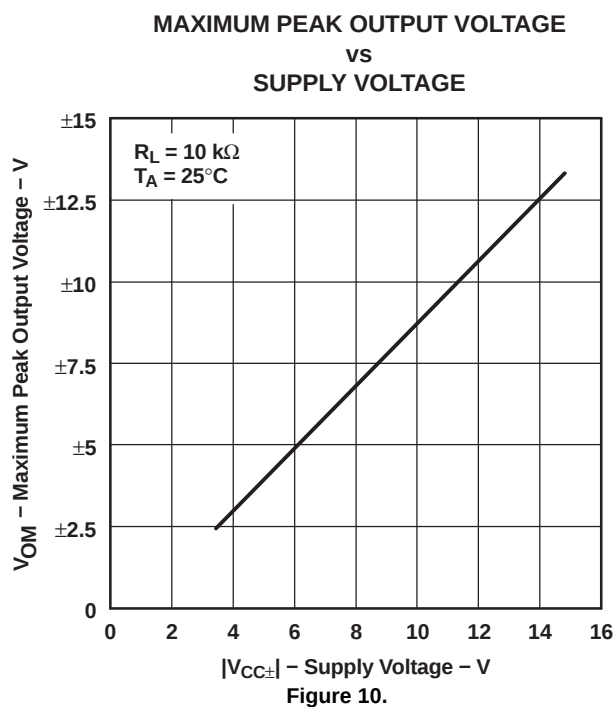
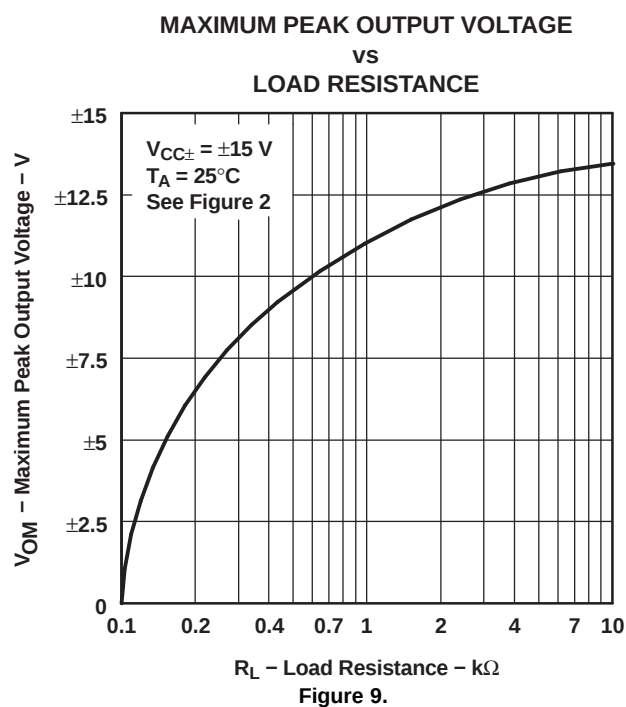
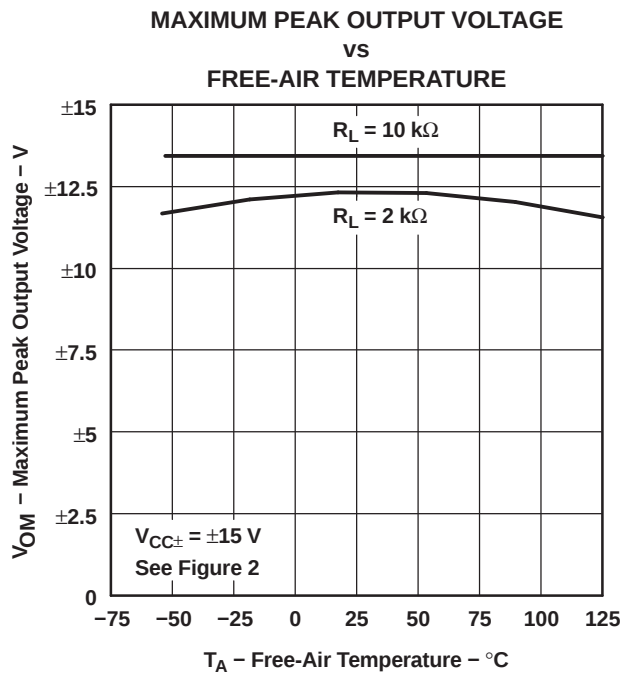
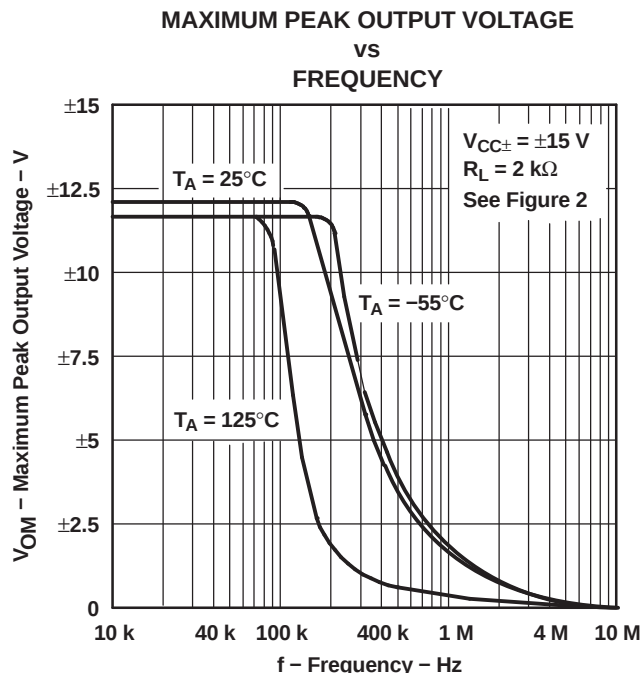
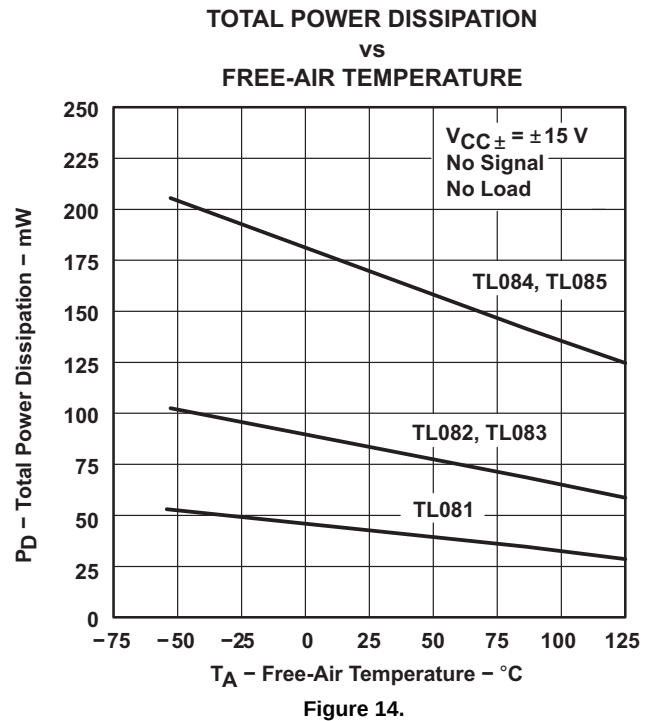
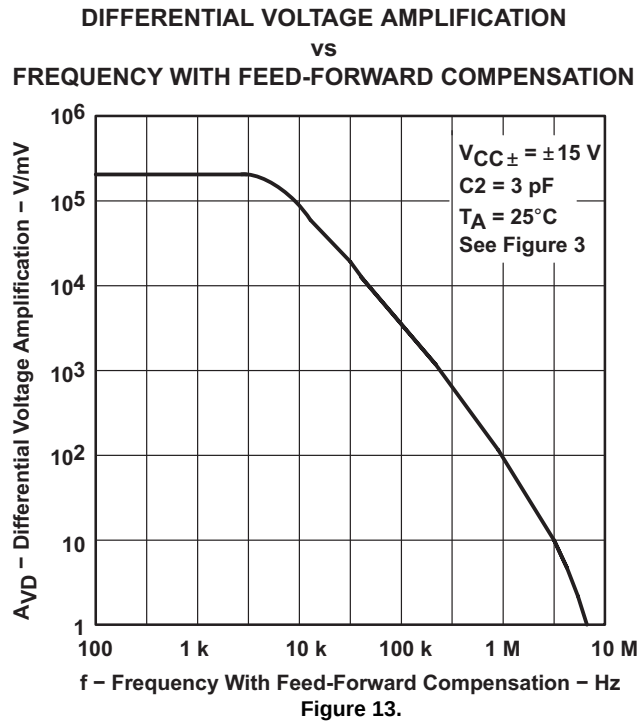
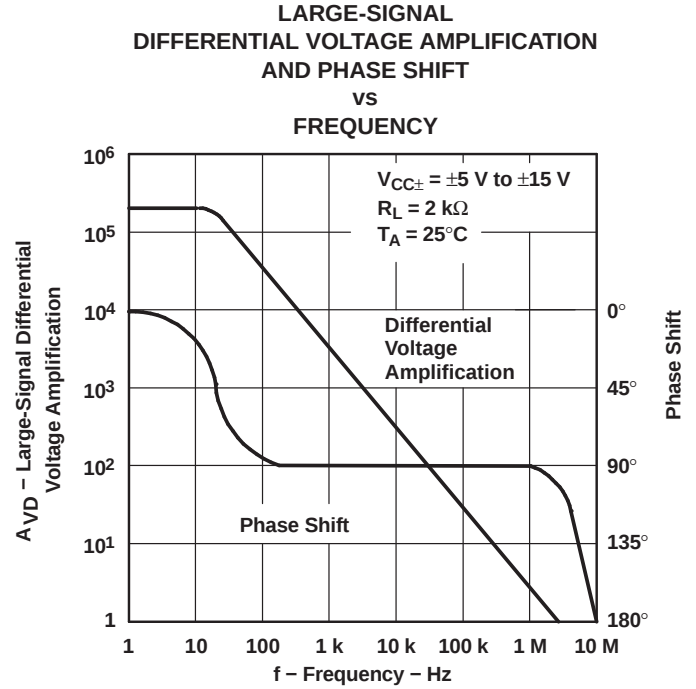
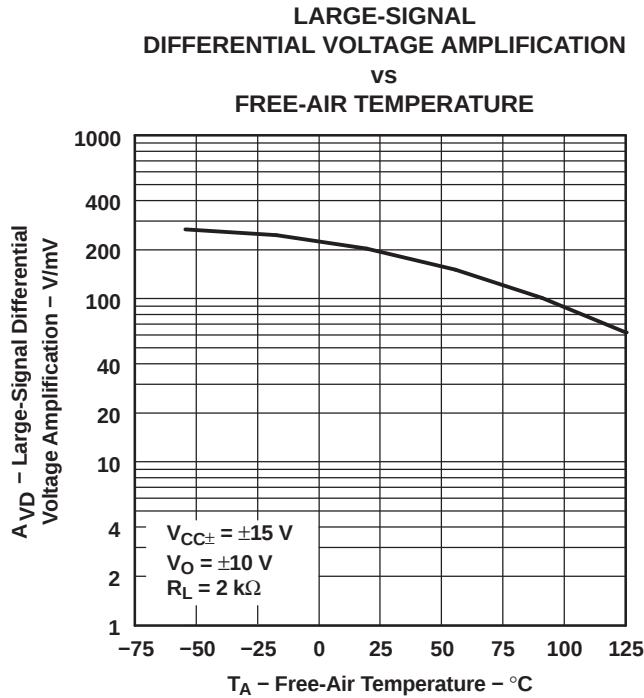
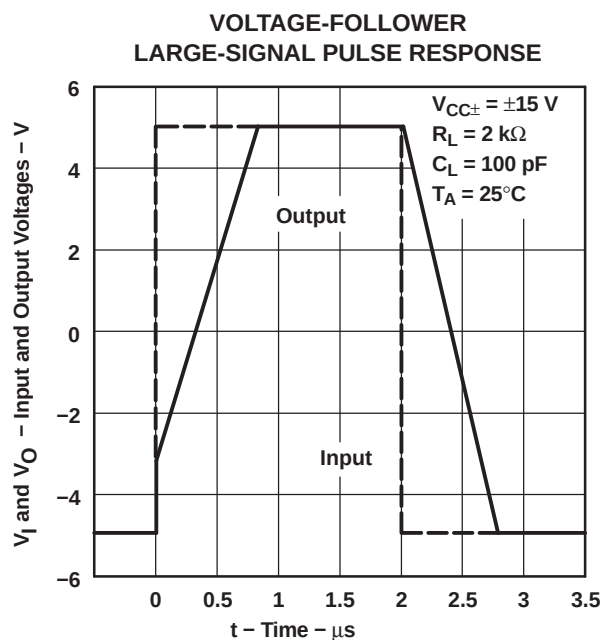
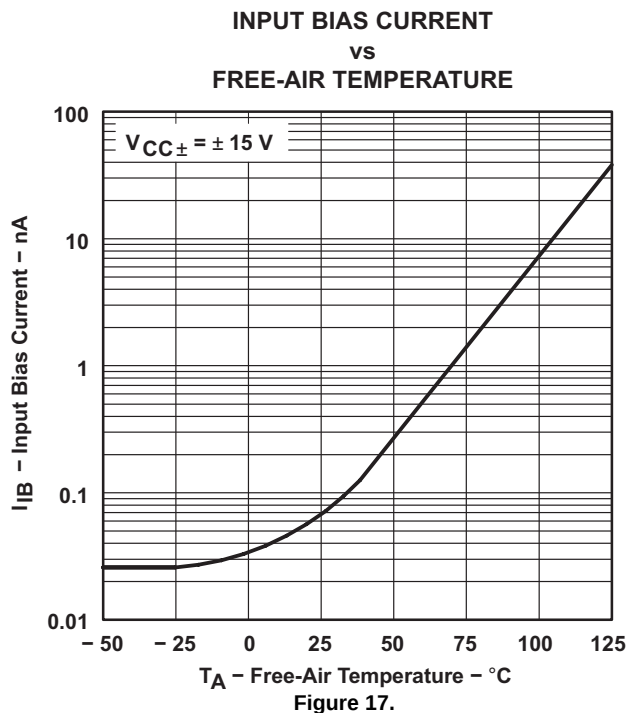
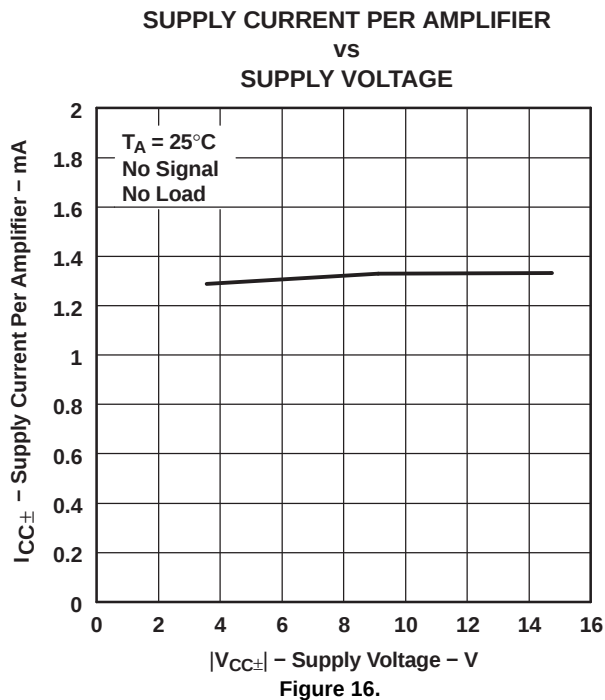
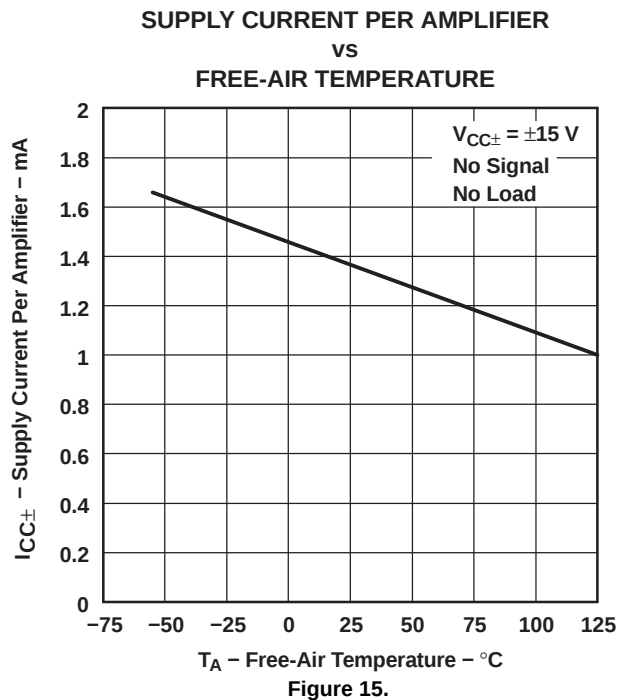
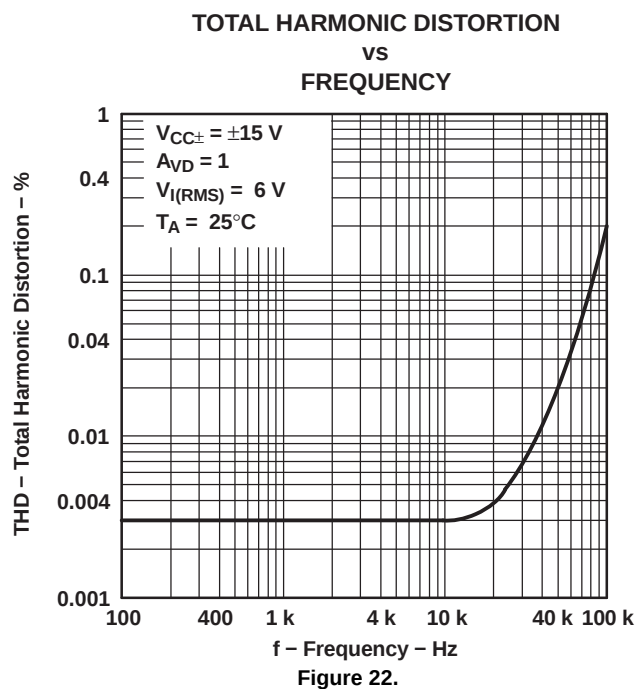
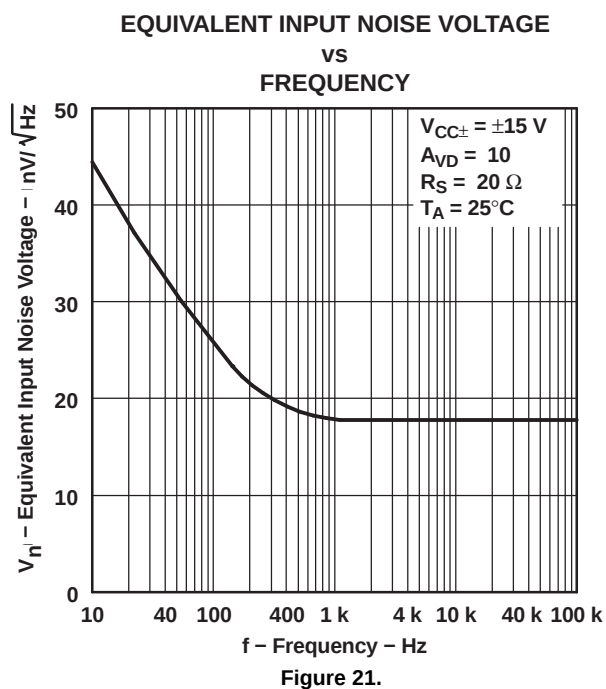
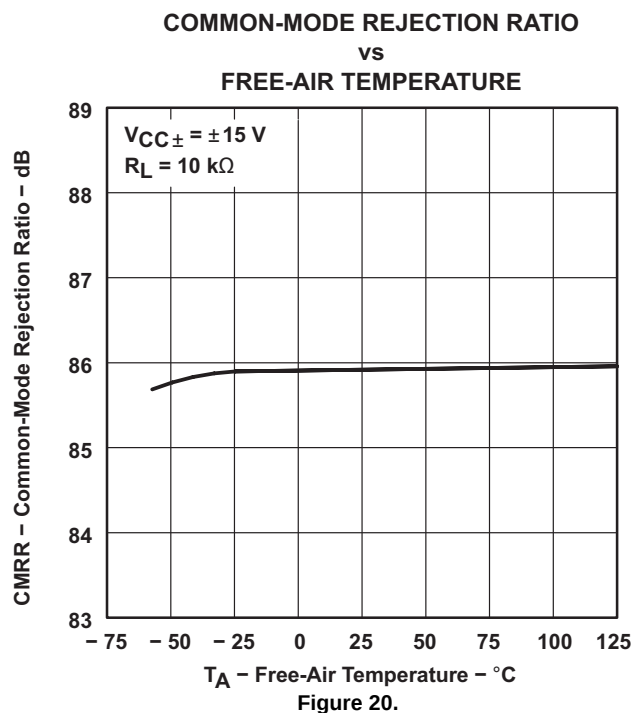
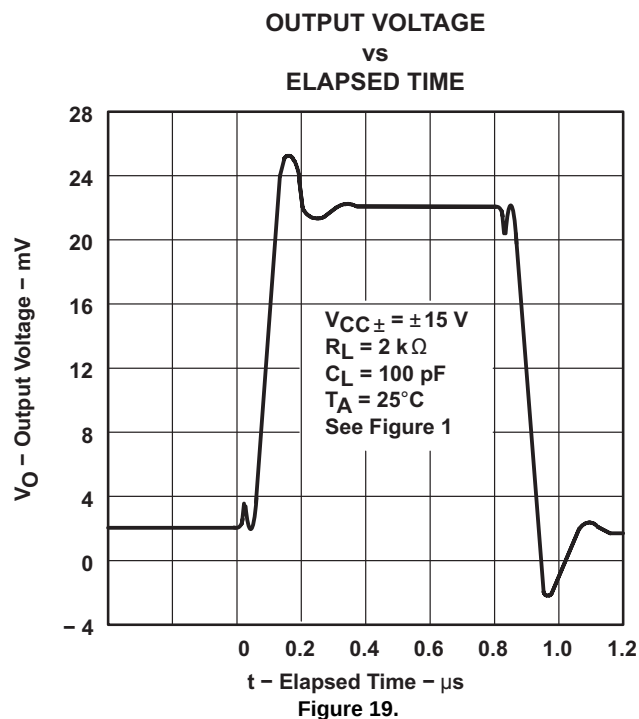


Figure 6.









## APPLICATION INFORMATION

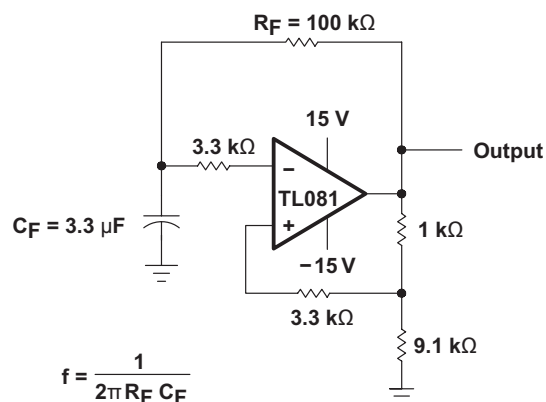


Figure 23.

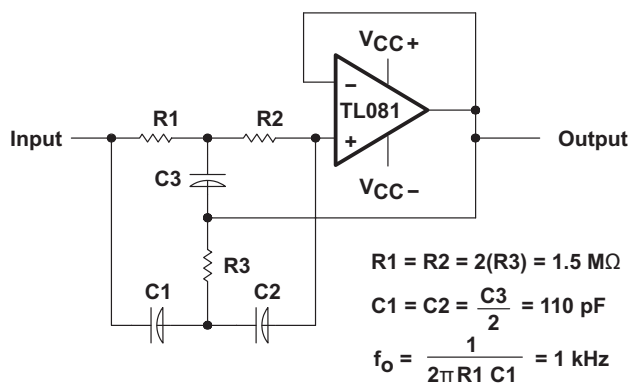


Figure 24.

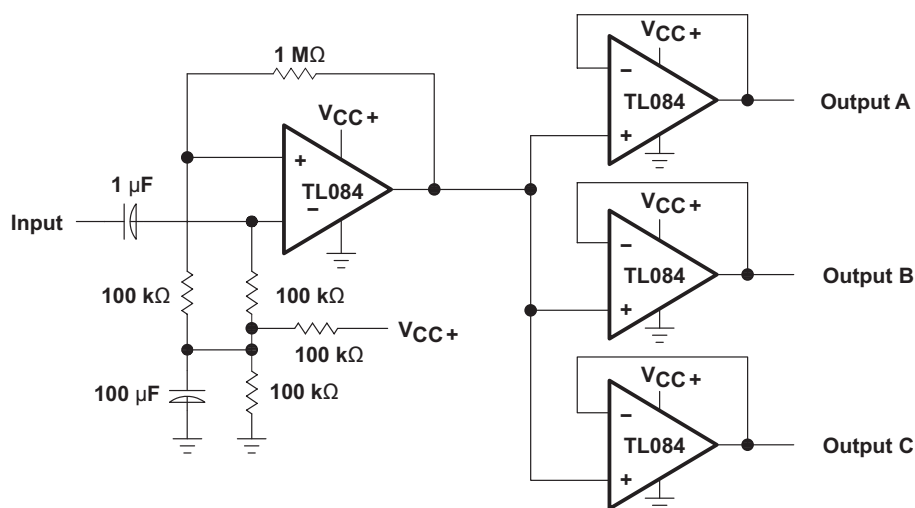
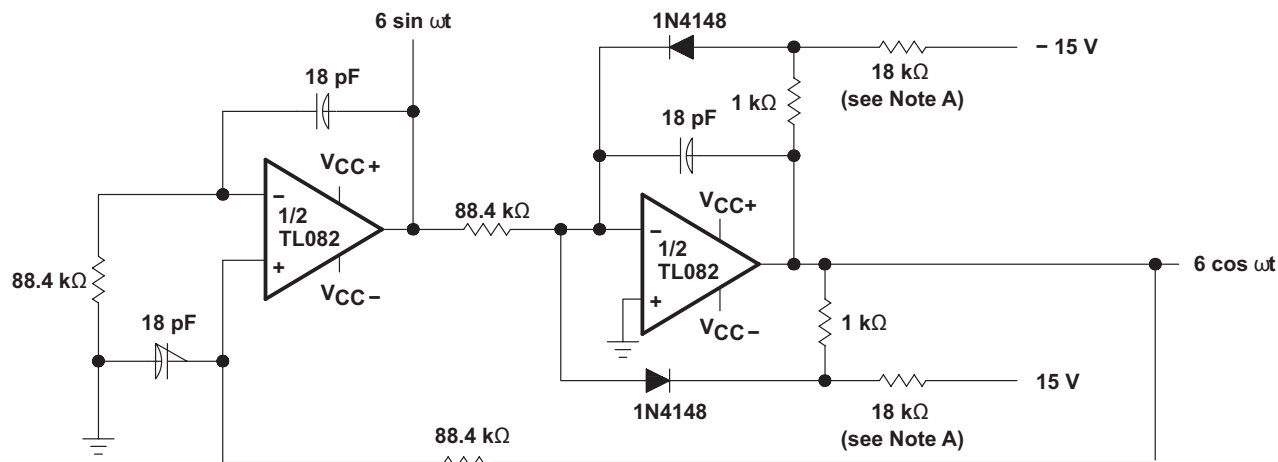


Figure 25. Audio-Distribution Amplifier



A. These resistor values may be adjusted for a symmetrical output.

Figure 26. 100-KHz Quadrature Oscillator

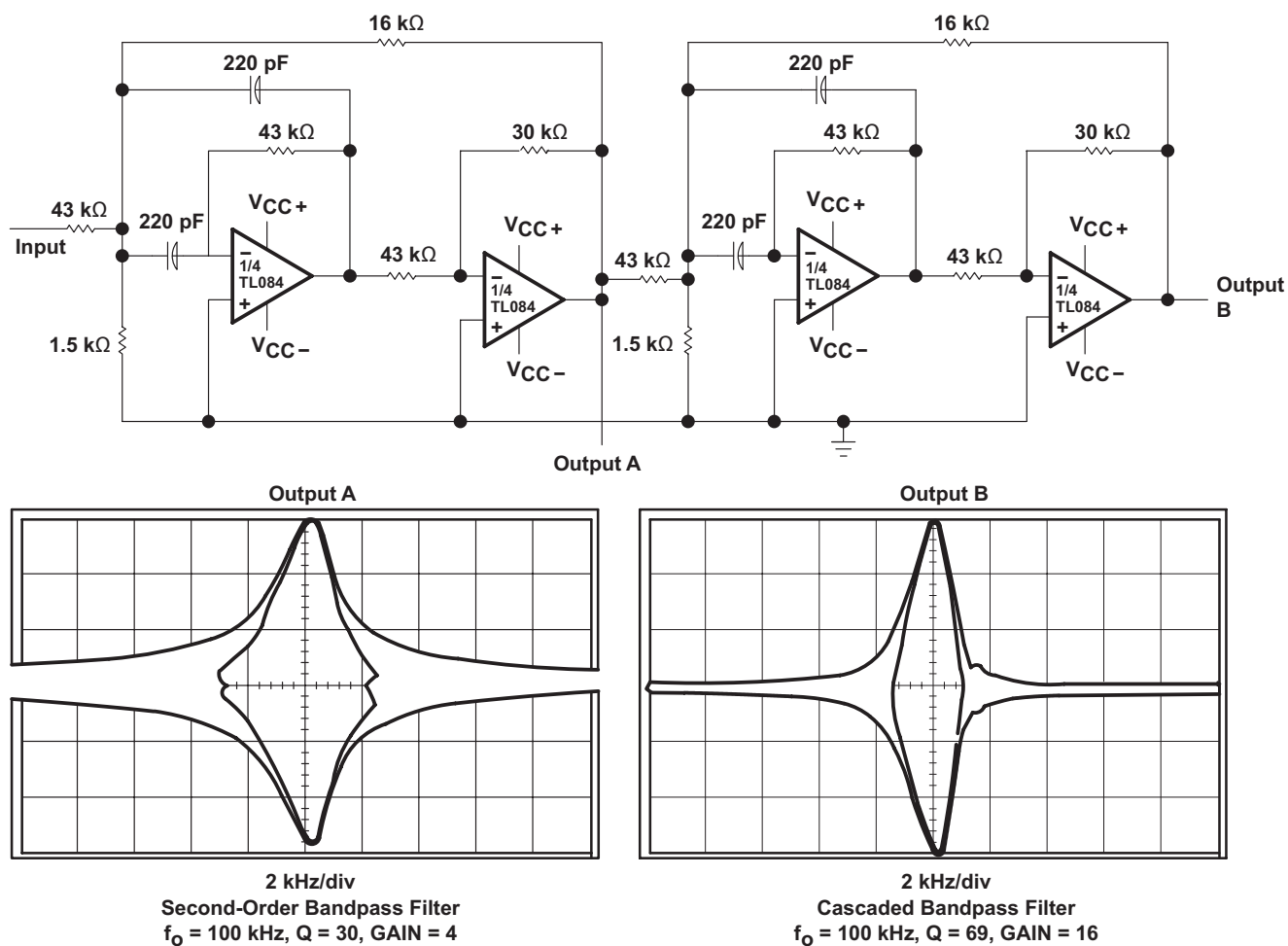


Figure 27. Positive-Feedback Bandpass Filter

## REVISION HISTORY

| Changes from Revision G (September 2004) to Revision H                         | Page              |
|--------------------------------------------------------------------------------|-------------------|
| • Updated document to new TI datasheet format - no specification changes. .... | <a href="#">1</a> |
| • Added ESD warning. ....                                                      | <a href="#">2</a> |

**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5)          | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|----------------------------------|-------------------------|
| 5962-9851501Q2A  | ACTIVE        | LCCC         | FK                 | 20   | 1              | TBD                        | POST-PLATE              | N / A for Pkg Type   | -55 to 125   | 5962-9851501Q2A<br>TL082MFKB     | <a href="#">Samples</a> |
| 5962-9851501QPA  | ACTIVE        | CDIP         | JG                 | 8    | 1              | TBD                        | A42                     | N / A for Pkg Type   | -55 to 125   | 9851501QPA<br>TL082M             | <a href="#">Samples</a> |
| 5962-9851503Q2A  | ACTIVE        | LCCC         | FK                 | 20   | 1              | TBD                        | POST-PLATE              | N / A for Pkg Type   | -55 to 125   | 5962-9851503Q2A<br>TL084<br>MFKB | <a href="#">Samples</a> |
| 5962-9851503QCA  | ACTIVE        | CDIP         | J                  | 14   | 1              | TBD                        | A42                     | N / A for Pkg Type   | -55 to 125   | 5962-9851503QC<br>A<br>TL084MJB  | <a href="#">Samples</a> |
| TL081ACD         | ACTIVE        | SOIC         | D                  | 8    | 75             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | 081AC                            | <a href="#">Samples</a> |
| TL081ACDR        | ACTIVE        | SOIC         | D                  | 8    | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | 081AC                            | <a href="#">Samples</a> |
| TL081ACJG        | OBSOLETE      | CDIP         | JG                 | 8    |                | TBD                        | Call TI                 | Call TI              | 0 to 70      |                                  |                         |
| TL081ACP         | ACTIVE        | PDIP         | P                  | 8    | 50             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | 0 to 70      | TL081ACP                         | <a href="#">Samples</a> |
| TL081ACPE4       | ACTIVE        | PDIP         | P                  | 8    | 50             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | 0 to 70      | TL081ACP                         | <a href="#">Samples</a> |
| TL081BCD         | ACTIVE        | SOIC         | D                  | 8    | 75             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | 081BC                            | <a href="#">Samples</a> |
| TL081BCDR        | ACTIVE        | SOIC         | D                  | 8    | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | 081BC                            | <a href="#">Samples</a> |
| TL081BCP         | ACTIVE        | PDIP         | P                  | 8    | 50             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | 0 to 70      | TL081BCP                         | <a href="#">Samples</a> |
| TL081BCPE4       | ACTIVE        | PDIP         | P                  | 8    | 50             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | 0 to 70      | TL081BCP                         | <a href="#">Samples</a> |
| TL081CD          | ACTIVE        | SOIC         | D                  | 8    | 75             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL081C                           | <a href="#">Samples</a> |
| TL081CDR         | ACTIVE        | SOIC         | D                  | 8    | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL081C                           | <a href="#">Samples</a> |
| TL081CP          | ACTIVE        | PDIP         | P                  | 8    | 50             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | 0 to 70      | TL081CP                          | <a href="#">Samples</a> |

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| TL081CPE4        | ACTIVE        | PDIP         | P                  | 8    | 50             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | 0 to 70      | TL081CP                 | <a href="#">Samples</a> |
| TL081CPSR        | ACTIVE        | SO           | PS                 | 8    | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | T081                    | <a href="#">Samples</a> |
| TL081CPWLE       | OBSOLETE      | TSSOP        | PW                 | 8    |                | TBD                        | Call TI                 | Call TI              | 0 to 70      |                         |                         |
| TL081ID          | ACTIVE        | SOIC         | D                  | 8    | 75             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | TL081I                  | <a href="#">Samples</a> |
| TL081IDG4        | ACTIVE        | SOIC         | D                  | 8    | 75             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | TL081I                  | <a href="#">Samples</a> |
| TL081IDR         | ACTIVE        | SOIC         | D                  | 8    | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | TL081I                  | <a href="#">Samples</a> |
| TL081IDRE4       | ACTIVE        | SOIC         | D                  | 8    | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | TL081I                  | <a href="#">Samples</a> |
| TL081IDRG4       | ACTIVE        | SOIC         | D                  | 8    | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | TL081I                  | <a href="#">Samples</a> |
| TL081IP          | ACTIVE        | PDIP         | P                  | 8    | 50             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | -40 to 85    | TL081IP                 | <a href="#">Samples</a> |
| TL081MFKB        | OBSOLETE      | LCCC         | FK                 | 20   |                | TBD                        | Call TI                 | Call TI              | -55 to 125   |                         |                         |
| TL081MJG         | OBSOLETE      | CDIP         | JG                 | 8    |                | TBD                        | Call TI                 | Call TI              | -55 to 125   |                         |                         |
| TL081MJGB        | OBSOLETE      | CDIP         | JG                 | 8    |                | TBD                        | Call TI                 | Call TI              | -55 to 125   |                         |                         |
| TL082ACD         | ACTIVE        | SOIC         | D                  | 8    | 75             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | 082AC                   | <a href="#">Samples</a> |
| TL082ACDE4       | ACTIVE        | SOIC         | D                  | 8    | 75             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | 082AC                   | <a href="#">Samples</a> |
| TL082ACDG4       | ACTIVE        | SOIC         | D                  | 8    | 75             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | 082AC                   | <a href="#">Samples</a> |
| TL082ACDR        | ACTIVE        | SOIC         | D                  | 8    | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | 082AC                   | <a href="#">Samples</a> |
| TL082ACDRE4      | ACTIVE        | SOIC         | D                  | 8    | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | 082AC                   | <a href="#">Samples</a> |
| TL082ACDRG4      | ACTIVE        | SOIC         | D                  | 8    | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | 082AC                   | <a href="#">Samples</a> |
| TL082ACP         | ACTIVE        | PDIP         | P                  | 8    | 50             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | 0 to 70      | TL082ACP                | <a href="#">Samples</a> |
| TL082ACPE4       | ACTIVE        | PDIP         | P                  | 8    | 50             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | 0 to 70      | TL082ACP                | <a href="#">Samples</a> |

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| TL082ACPSR       | ACTIVE        | SO           | PS                 | 8    | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | T082A                   | <a href="#">Samples</a> |
| TL082BCD         | ACTIVE        | SOIC         | D                  | 8    | 75             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | 082BC                   | <a href="#">Samples</a> |
| TL082BCDE4       | ACTIVE        | SOIC         | D                  | 8    | 75             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | 082BC                   | <a href="#">Samples</a> |
| TL082BCDG4       | ACTIVE        | SOIC         | D                  | 8    | 75             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | 082BC                   | <a href="#">Samples</a> |
| TL082BCDR        | ACTIVE        | SOIC         | D                  | 8    | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | 082BC                   | <a href="#">Samples</a> |
| TL082BCDRE4      | ACTIVE        | SOIC         | D                  | 8    | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | 082BC                   | <a href="#">Samples</a> |
| TL082BCDRG4      | ACTIVE        | SOIC         | D                  | 8    | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | 082BC                   | <a href="#">Samples</a> |
| TL082BCP         | ACTIVE        | PDIP         | P                  | 8    | 50             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | 0 to 70      | TL082BCP                | <a href="#">Samples</a> |
| TL082BCPE4       | ACTIVE        | PDIP         | P                  | 8    | 50             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | 0 to 70      | TL082BCP                | <a href="#">Samples</a> |
| TL082CD          | ACTIVE        | SOIC         | D                  | 8    | 75             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL082C                  | <a href="#">Samples</a> |
| TL082CDE4        | ACTIVE        | SOIC         | D                  | 8    | 75             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL082C                  | <a href="#">Samples</a> |
| TL082CDG4        | ACTIVE        | SOIC         | D                  | 8    | 75             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL082C                  | <a href="#">Samples</a> |
| TL082CDR         | ACTIVE        | SOIC         | D                  | 8    | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL082C                  | <a href="#">Samples</a> |
| TL082CDRE4       | ACTIVE        | SOIC         | D                  | 8    | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL082C                  | <a href="#">Samples</a> |
| TL082CDRG4       | ACTIVE        | SOIC         | D                  | 8    | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL082C                  | <a href="#">Samples</a> |
| TL082CJG         | OBSOLETE      | CDIP         | JG                 | 8    |                | TBD                        | Call TI                 | Call TI              | 0 to 70      |                         |                         |
| TL082CP          | ACTIVE        | PDIP         | P                  | 8    | 50             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | 0 to 70      | TL082CP                 | <a href="#">Samples</a> |
| TL082CPE4        | ACTIVE        | PDIP         | P                  | 8    | 50             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | 0 to 70      | TL082CP                 | <a href="#">Samples</a> |

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| TL082CPSR        | ACTIVE        | SO           | PS                 | 8    | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | T082                    | <a href="#">Samples</a> |
| TL082CPSRG4      | ACTIVE        | SO           | PS                 | 8    | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | T082                    | <a href="#">Samples</a> |
| TL082CPW         | ACTIVE        | TSSOP        | PW                 | 8    | 150            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | T082                    | <a href="#">Samples</a> |
| TL082CPWE4       | ACTIVE        | TSSOP        | PW                 | 8    | 150            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | T082                    | <a href="#">Samples</a> |
| TL082CPWG4       | ACTIVE        | TSSOP        | PW                 | 8    | 150            | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | T082                    | <a href="#">Samples</a> |
| TL082CPWLE       | OBSOLETE      | TSSOP        | PW                 | 8    |                | TBD                        | Call TI                 | Call TI              | 0 to 70      |                         |                         |
| TL082CPWR        | ACTIVE        | TSSOP        | PW                 | 8    | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | T082                    | <a href="#">Samples</a> |
| TL082CPWRG4      | ACTIVE        | TSSOP        | PW                 | 8    | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | T082                    | <a href="#">Samples</a> |
| TL082ID          | ACTIVE        | SOIC         | D                  | 8    | 75             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | TL082I                  | <a href="#">Samples</a> |
| TL082IDG4        | ACTIVE        | SOIC         | D                  | 8    | 75             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | TL082I                  | <a href="#">Samples</a> |
| TL082IDR         | ACTIVE        | SOIC         | D                  | 8    | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | TL082I                  | <a href="#">Samples</a> |
| TL082IDRE4       | ACTIVE        | SOIC         | D                  | 8    | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | TL082I                  | <a href="#">Samples</a> |
| TL082IDRG4       | ACTIVE        | SOIC         | D                  | 8    | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | TL082I                  | <a href="#">Samples</a> |
| TL082IJG         | OBSOLETE      | CDIP         | JG                 | 8    |                | TBD                        | Call TI                 | Call TI              | -40 to 85    |                         |                         |
| TL082IP          | ACTIVE        | PDIP         | P                  | 8    | 50             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | -40 to 85    | TL082IP                 | <a href="#">Samples</a> |
| TL082IPE4        | ACTIVE        | PDIP         | P                  | 8    | 50             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | -40 to 85    | TL082IP                 | <a href="#">Samples</a> |
| TL082IPWR        | ACTIVE        | TSSOP        | PW                 | 8    | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | Z082                    | <a href="#">Samples</a> |
| TL082IPWRG4      | ACTIVE        | TSSOP        | PW                 | 8    | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | Z082                    | <a href="#">Samples</a> |
| TL082MFK         | OBSOLETE      | LCCC         | FK                 | 20   |                | TBD                        | Call TI                 | Call TI              | -55 to 125   |                         |                         |

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5)          | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|----------------------------------|-------------------------|
| TL082MFKB        | ACTIVE        | LCCC         | FK                 | 20   | 1              | TBD                        | POST-PLATE              | N / A for Pkg Type   | -55 to 125   | 5962-<br>9851501Q2A<br>TL082MFKB | <a href="#">Samples</a> |
| TL082MJG         | ACTIVE        | CDIP         | JG                 | 8    | 1              | TBD                        | A42                     | N / A for Pkg Type   | -55 to 125   | TL082MJG                         | <a href="#">Samples</a> |
| TL082MJGB        | ACTIVE        | CDIP         | JG                 | 8    | 1              | TBD                        | A42                     | N / A for Pkg Type   | -55 to 125   | 9851501QPA<br>TL082M             | <a href="#">Samples</a> |
| TL084ACD         | ACTIVE        | SOIC         | D                  | 14   | 50             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL084AC                          | <a href="#">Samples</a> |
| TL084ACDE4       | ACTIVE        | SOIC         | D                  | 14   | 50             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL084AC                          | <a href="#">Samples</a> |
| TL084ACDR        | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL084AC                          | <a href="#">Samples</a> |
| TL084ACDRE4      | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL084AC                          | <a href="#">Samples</a> |
| TL084ACDRG4      | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL084AC                          | <a href="#">Samples</a> |
| TL084ACN         | ACTIVE        | PDIP         | N                  | 14   | 25             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | 0 to 70      | TL084ACN                         | <a href="#">Samples</a> |
| TL084ACNSR       | ACTIVE        | SO           | NS                 | 14   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL084A                           | <a href="#">Samples</a> |
| TL084ACNSRG4     | ACTIVE        | SO           | NS                 | 14   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL084A                           | <a href="#">Samples</a> |
| TL084BCD         | ACTIVE        | SOIC         | D                  | 14   | 50             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL084BC                          | <a href="#">Samples</a> |
| TL084BCDE4       | ACTIVE        | SOIC         | D                  | 14   | 50             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL084BC                          | <a href="#">Samples</a> |
| TL084BCDR        | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL084BC                          | <a href="#">Samples</a> |
| TL084BCDRG4      | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL084BC                          | <a href="#">Samples</a> |
| TL084BCN         | ACTIVE        | PDIP         | N                  | 14   | 25             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | 0 to 70      | TL084BCN                         | <a href="#">Samples</a> |
| TL084BCNE4       | ACTIVE        | PDIP         | N                  | 14   | 25             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | 0 to 70      | TL084BCN                         | <a href="#">Samples</a> |
| TL084CD          | ACTIVE        | SOIC         | D                  | 14   | 50             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL084C                           | <a href="#">Samples</a> |

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| TL084CDE4        | ACTIVE        | SOIC         | D                  | 14   | 50             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL084C                  | <a href="#">Samples</a> |
| TL084CDG4        | ACTIVE        | SOIC         | D                  | 14   | 50             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL084C                  | <a href="#">Samples</a> |
| TL084CDR         | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL084C                  | <a href="#">Samples</a> |
| TL084CDRE4       | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL084C                  | <a href="#">Samples</a> |
| TL084CDRG4       | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL084C                  | <a href="#">Samples</a> |
| TL084CJ          | OBSOLETE      | CDIP         | J                  | 14   |                | TBD                        | Call TI                 | Call TI              | 0 to 70      |                         |                         |
| TL084CN          | ACTIVE        | PDIP         | N                  | 14   | 25             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | 0 to 70      | TL084CN                 | <a href="#">Samples</a> |
| TL084CNE4        | ACTIVE        | PDIP         | N                  | 14   | 25             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | 0 to 70      | TL084CN                 | <a href="#">Samples</a> |
| TL084CNSLE       | OBSOLETE      | SO           | NS                 | 14   |                | TBD                        | Call TI                 | Call TI              | 0 to 70      |                         |                         |
| TL084CNSR        | ACTIVE        | SO           | NS                 | 14   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL084                   | <a href="#">Samples</a> |
| TL084CNSRG4      | ACTIVE        | SO           | NS                 | 14   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | TL084                   | <a href="#">Samples</a> |
| TL084CPW         | ACTIVE        | TSSOP        | PW                 | 14   | 90             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | T084                    | <a href="#">Samples</a> |
| TL084CPWE4       | ACTIVE        | TSSOP        | PW                 | 14   | 90             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | T084                    | <a href="#">Samples</a> |
| TL084CPWG4       | ACTIVE        | TSSOP        | PW                 | 14   | 90             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | T084                    | <a href="#">Samples</a> |
| TL084CPWLE       | OBSOLETE      | TSSOP        | PW                 | 14   |                | TBD                        | Call TI                 | Call TI              | 0 to 70      |                         |                         |
| TL084CPWR        | ACTIVE        | TSSOP        | PW                 | 14   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | 0 to 70      | T084                    | <a href="#">Samples</a> |
| TL084ID          | ACTIVE        | SOIC         | D                  | 14   | 50             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | TL084I                  | <a href="#">Samples</a> |
| TL084IDE4        | ACTIVE        | SOIC         | D                  | 14   | 50             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | TL084I                  | <a href="#">Samples</a> |
| TL084IDG4        | ACTIVE        | SOIC         | D                  | 14   | 50             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | TL084I                  | <a href="#">Samples</a> |

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5)              | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|--------------------------------------|-------------------------|
| TL084IDR         | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | TL084I                               | <a href="#">Samples</a> |
| TL084IDRE4       | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | TL084I                               | <a href="#">Samples</a> |
| TL084IDRG4       | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | TL084I                               | <a href="#">Samples</a> |
| TL084IJ          | OBSOLETE      | CDIP         | J                  | 14   |                | TBD                        | Call TI                 | Call TI              | -40 to 85    |                                      |                         |
| TL084IN          | ACTIVE        | PDIP         | N                  | 14   | 25             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | -40 to 85    | TL084IN                              | <a href="#">Samples</a> |
| TL084INE4        | ACTIVE        | PDIP         | N                  | 14   | 25             | Pb-Free<br>(RoHS)          | CU NIPDAU               | N / A for Pkg Type   | -40 to 85    | TL084IN                              | <a href="#">Samples</a> |
| TL084MFK         | ACTIVE        | LCCC         | FK                 | 20   | 1              | TBD                        | POST-PLATE              | N / A for Pkg Type   | -55 to 125   | TL084MFK                             | <a href="#">Samples</a> |
| TL084MFKB        | ACTIVE        | LCCC         | FK                 | 20   | 1              | TBD                        | POST-PLATE              | N / A for Pkg Type   | -55 to 125   | 5962-<br>9851503Q2A<br>TL084<br>MFKB | <a href="#">Samples</a> |
| TL084MJ          | ACTIVE        | CDIP         | J                  | 14   | 1              | TBD                        | A42                     | N / A for Pkg Type   | -55 to 125   | TL084MJ                              | <a href="#">Samples</a> |
| TL084MJB         | ACTIVE        | CDIP         | J                  | 14   | 1              | TBD                        | A42                     | N / A for Pkg Type   | -55 to 125   | 5962-9851503QC<br>A<br>TL084MJB      | <a href="#">Samples</a> |
| TL084QD          | ACTIVE        | SOIC         | D                  | 14   | 50             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | TL084Q                               | <a href="#">Samples</a> |
| TL084QDG4        | ACTIVE        | SOIC         | D                  | 14   | 50             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | TL084Q                               | <a href="#">Samples</a> |
| TL084QDR         | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | TL084Q                               | <a href="#">Samples</a> |
| TL084QDRG4       | ACTIVE        | SOIC         | D                  | 14   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 125   | TL084Q                               | <a href="#">Samples</a> |

<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.

**OBSOLETE:** 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.

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

<sup>(5)</sup> Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

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

**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

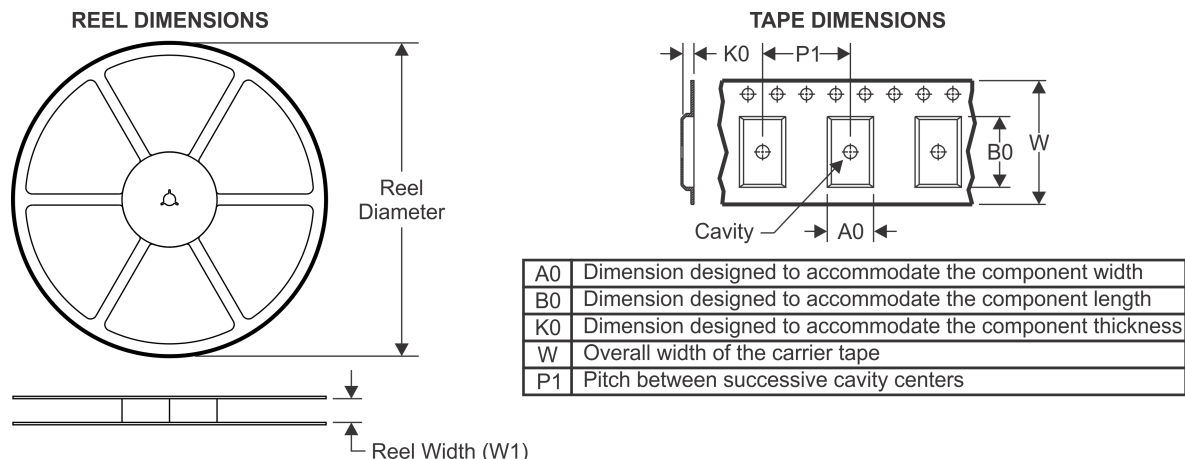
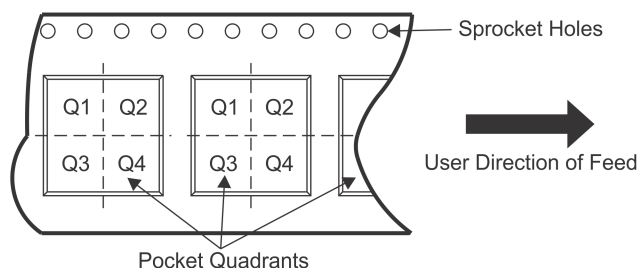
**OTHER QUALIFIED VERSIONS OF TL082, TL082M, TL084, TL084M :**

- Catalog: [TL082](#), [TL084](#)
- Automotive: [TL082-Q1](#), [TL082-Q1](#)
- Military: [TL082M](#), [TL084M](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

- 
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
  - Military - QML certified for Military and Defense Applications

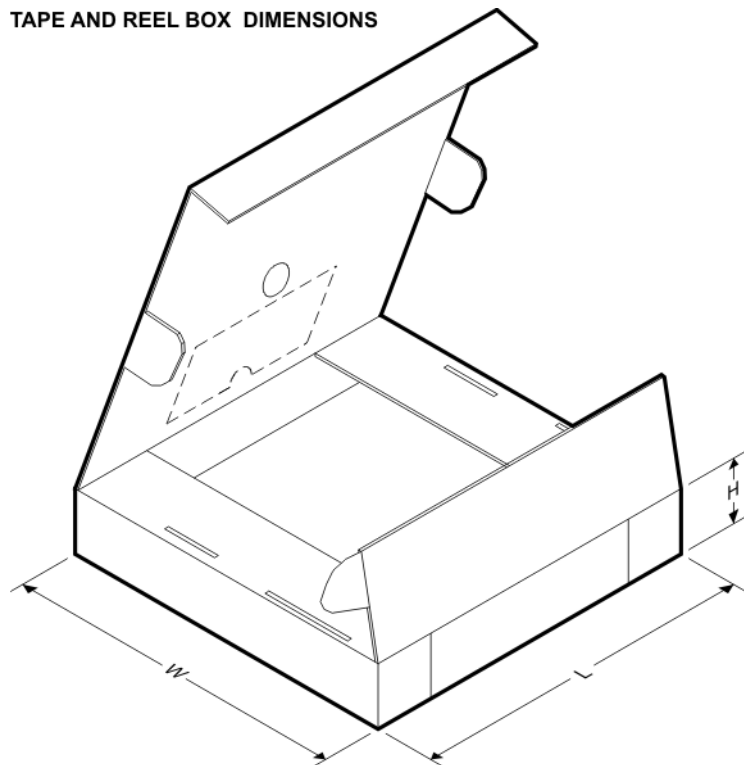
**TAPE AND REEL INFORMATION**

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


\*All dimensions are nominal

| Device     | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| TL081ACDR  | SOIC         | D               | 8    | 2500 | 330.0              | 12.4               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |
| TL081BCDR  | SOIC         | D               | 8    | 2500 | 330.0              | 12.4               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |
| TL081CDR   | SOIC         | D               | 8    | 2500 | 330.0              | 12.4               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |
| TL081CPSR  | SO           | PS              | 8    | 2000 | 330.0              | 16.4               | 8.2     | 6.6     | 2.5     | 12.0    | 16.0   | Q1            |
| TL081IDR   | SOIC         | D               | 8    | 2500 | 330.0              | 12.4               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |
| TL082ACDR  | SOIC         | D               | 8    | 2500 | 330.0              | 12.4               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |
| TL082ACDR  | SOIC         | D               | 8    | 2500 | 330.0              | 12.4               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |
| TL082ACPSR | SO           | PS              | 8    | 2000 | 330.0              | 16.4               | 8.2     | 6.6     | 2.5     | 12.0    | 16.0   | Q1            |
| TL082BCDR  | SOIC         | D               | 8    | 2500 | 330.0              | 12.4               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |
| TL082CDR   | SOIC         | D               | 8    | 2500 | 330.0              | 12.4               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |
| TL082CDR   | SOIC         | D               | 8    | 2500 | 330.0              | 12.4               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |
| TL082CPWR  | TSSOP        | PW              | 8    | 2000 | 330.0              | 12.4               | 7.0     | 3.6     | 1.6     | 8.0     | 12.0   | Q1            |
| TL082IDR   | SOIC         | D               | 8    | 2500 | 330.0              | 12.4               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |
| TL082IDR   | SOIC         | D               | 8    | 2500 | 330.0              | 12.4               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |
| TL082IPWR  | TSSOP        | PW              | 8    | 2000 | 330.0              | 12.4               | 7.0     | 3.6     | 1.6     | 8.0     | 12.0   | Q1            |
| TL084ACDR  | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| TL084ACDR  | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| TL084ACNSR | SO           | NS              | 14   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |

| 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 |
|------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| TL084BCDR  | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| TL084CDR   | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| TL084CDRG4 | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| TL084CPWR  | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| TL084IDR   | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| TL084QDR   | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| TL084QDRG4 | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



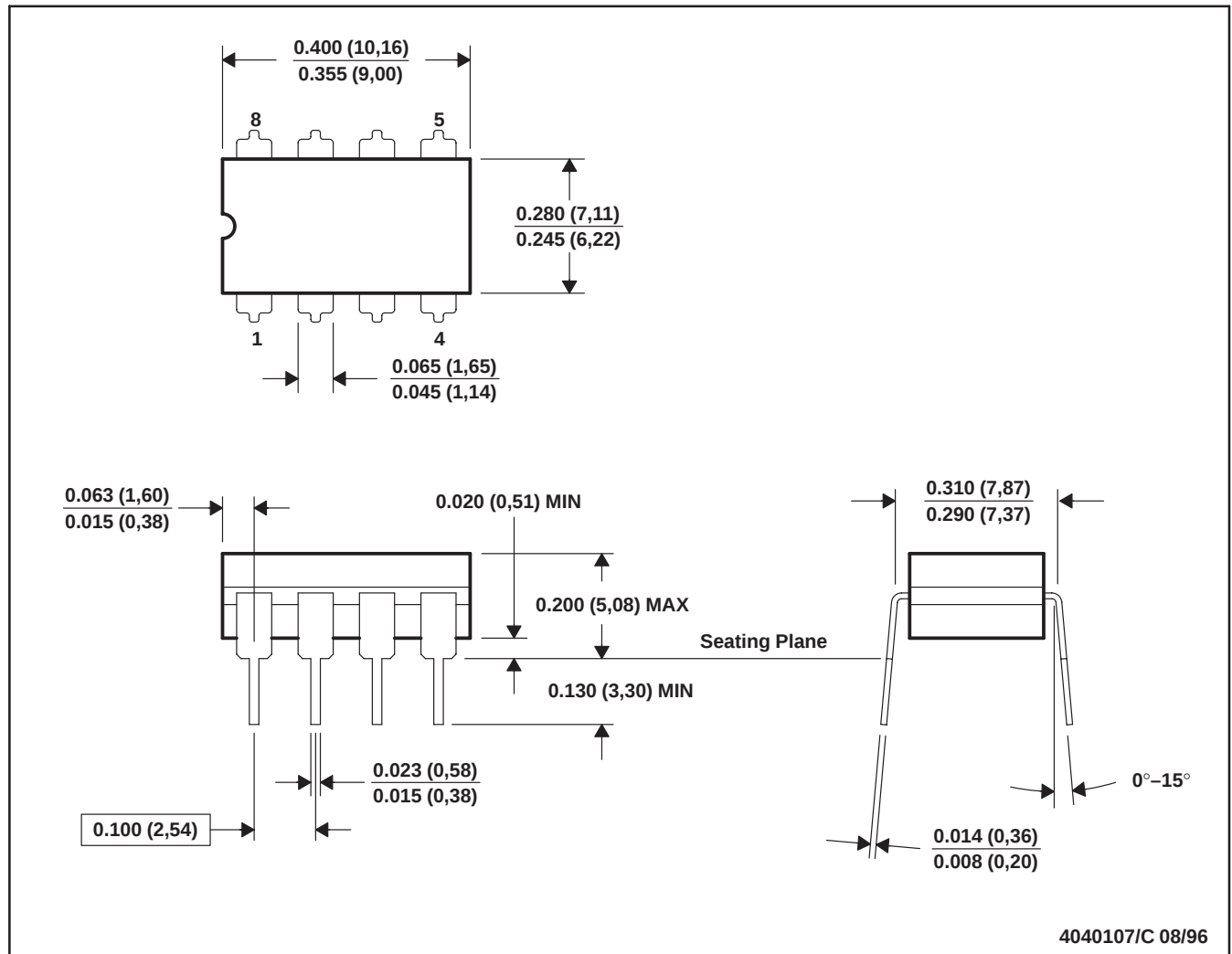
\*All dimensions are nominal

| Device     | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|------------|--------------|-----------------|------|------|-------------|------------|-------------|
| TL081ACDR  | SOIC         | D               | 8    | 2500 | 340.5       | 338.1      | 20.6        |
| TL081BCDR  | SOIC         | D               | 8    | 2500 | 340.5       | 338.1      | 20.6        |
| TL081CDR   | SOIC         | D               | 8    | 2500 | 340.5       | 338.1      | 20.6        |
| TL081CPSR  | SO           | PS              | 8    | 2000 | 367.0       | 367.0      | 38.0        |
| TL081IDR   | SOIC         | D               | 8    | 2500 | 340.5       | 338.1      | 20.6        |
| TL082ACDR  | SOIC         | D               | 8    | 2500 | 367.0       | 367.0      | 35.0        |
| TL082ACDR  | SOIC         | D               | 8    | 2500 | 340.5       | 338.1      | 20.6        |
| TL082ACPSR | SO           | PS              | 8    | 2000 | 367.0       | 367.0      | 38.0        |
| TL082BCDR  | SOIC         | D               | 8    | 2500 | 340.5       | 338.1      | 20.6        |
| TL082CDR   | SOIC         | D               | 8    | 2500 | 340.5       | 338.1      | 20.6        |

| Device     | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|------------|--------------|-----------------|------|------|-------------|------------|-------------|
| TL082CDR   | SOIC         | D               | 8    | 2500 | 367.0       | 367.0      | 35.0        |
| TL082CPWR  | TSSOP        | PW              | 8    | 2000 | 367.0       | 367.0      | 35.0        |
| TL082IDR   | SOIC         | D               | 8    | 2500 | 340.5       | 338.1      | 20.6        |
| TL082IDR   | SOIC         | D               | 8    | 2500 | 367.0       | 367.0      | 35.0        |
| TL082IPWR  | TSSOP        | PW              | 8    | 2000 | 367.0       | 367.0      | 35.0        |
| TL084ACDR  | SOIC         | D               | 14   | 2500 | 367.0       | 367.0      | 38.0        |
| TL084ACDR  | SOIC         | D               | 14   | 2500 | 333.2       | 345.9      | 28.6        |
| TL084ACNSR | SO           | NS              | 14   | 2000 | 367.0       | 367.0      | 38.0        |
| TL084BCDR  | SOIC         | D               | 14   | 2500 | 333.2       | 345.9      | 28.6        |
| TL084CDR   | SOIC         | D               | 14   | 2500 | 333.2       | 345.9      | 28.6        |
| TL084CDRG4 | SOIC         | D               | 14   | 2500 | 333.2       | 345.9      | 28.6        |
| TL084CPWR  | TSSOP        | PW              | 14   | 2000 | 367.0       | 367.0      | 35.0        |
| TL084IDR   | SOIC         | D               | 14   | 2500 | 333.2       | 345.9      | 28.6        |
| TL084QDR   | SOIC         | D               | 14   | 2500 | 367.0       | 367.0      | 38.0        |
| TL084QDRG4 | SOIC         | D               | 14   | 2500 | 367.0       | 367.0      | 38.0        |

## JG (R-GDIP-T8)

## CERAMIC DUAL-IN-LINE

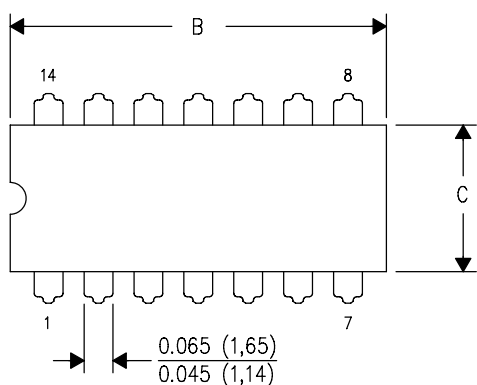


- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification.
  - E. Falls within MIL STD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

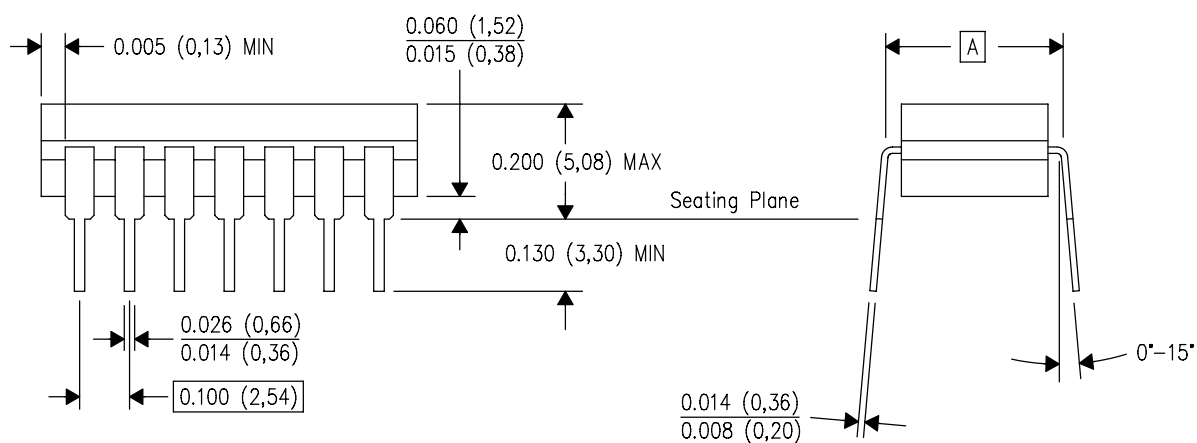
J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



| PINS **<br>DIM | 14                     | 16                     | 18                     | 20                     |
|----------------|------------------------|------------------------|------------------------|------------------------|
| A              | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC |
| B MAX          | 0.785<br>(19,94)       | .840<br>(21,34)        | 0.960<br>(24,38)       | 1.060<br>(26,92)       |
| B MIN          | —                      | —                      | —                      | —                      |
| C MAX          | 0.300<br>(7,62)        | 0.300<br>(7,62)        | 0.310<br>(7,87)        | 0.300<br>(7,62)        |
| C MIN          | 0.245<br>(6,22)        | 0.245<br>(6,22)        | 0.220<br>(5,59)        | 0.245<br>(6,22)        |



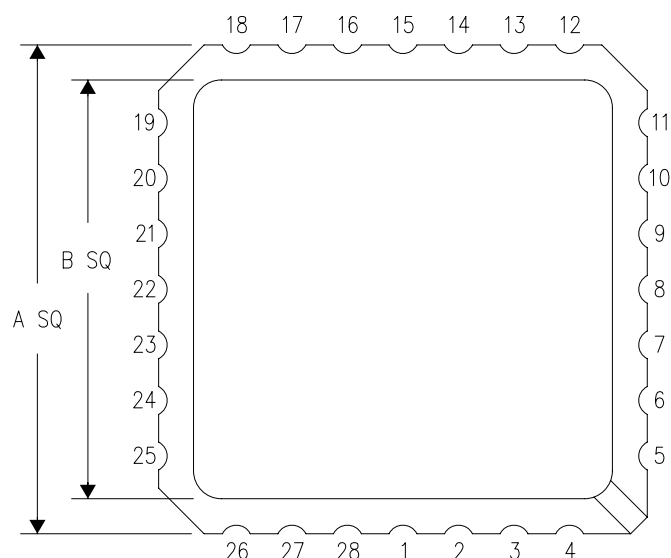
4040083/F 03/03

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

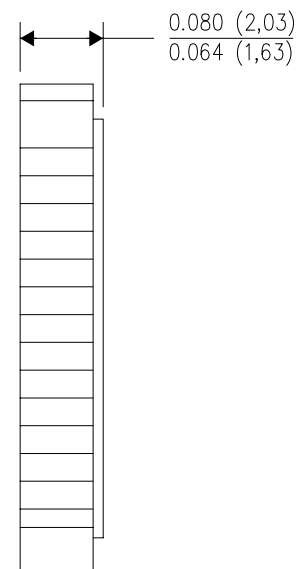
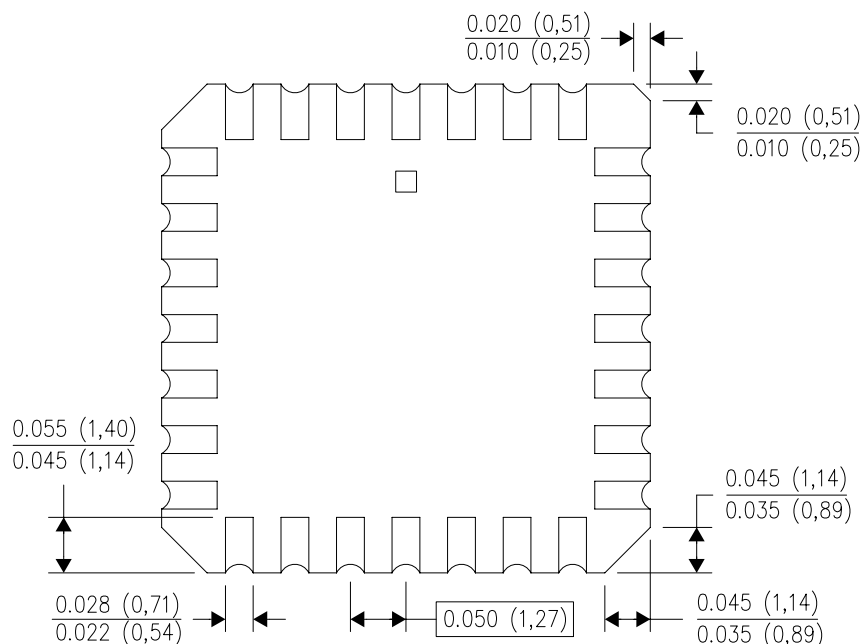
FK (S-CQCC-N\*\*)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



| NO. OF<br>TERMINALS<br>** | A                |                  | B                |                  |
|---------------------------|------------------|------------------|------------------|------------------|
|                           | MIN              | MAX              | MIN              | MAX              |
| 20                        | 0.342<br>(8,69)  | 0.358<br>(9,09)  | 0.307<br>(7,80)  | 0.358<br>(9,09)  |
| 28                        | 0.442<br>(11,23) | 0.458<br>(11,63) | 0.406<br>(10,31) | 0.458<br>(11,63) |
| 44                        | 0.640<br>(16,26) | 0.660<br>(16,76) | 0.495<br>(12,58) | 0.560<br>(14,22) |
| 52                        | 0.740<br>(18,78) | 0.761<br>(19,32) | 0.495<br>(12,58) | 0.560<br>(14,22) |
| 68                        | 0.938<br>(23,83) | 0.962<br>(24,43) | 0.850<br>(21,6)  | 0.858<br>(21,8)  |
| 84                        | 1.141<br>(28,99) | 1.165<br>(29,59) | 1.047<br>(26,6)  | 1.063<br>(27,0)  |

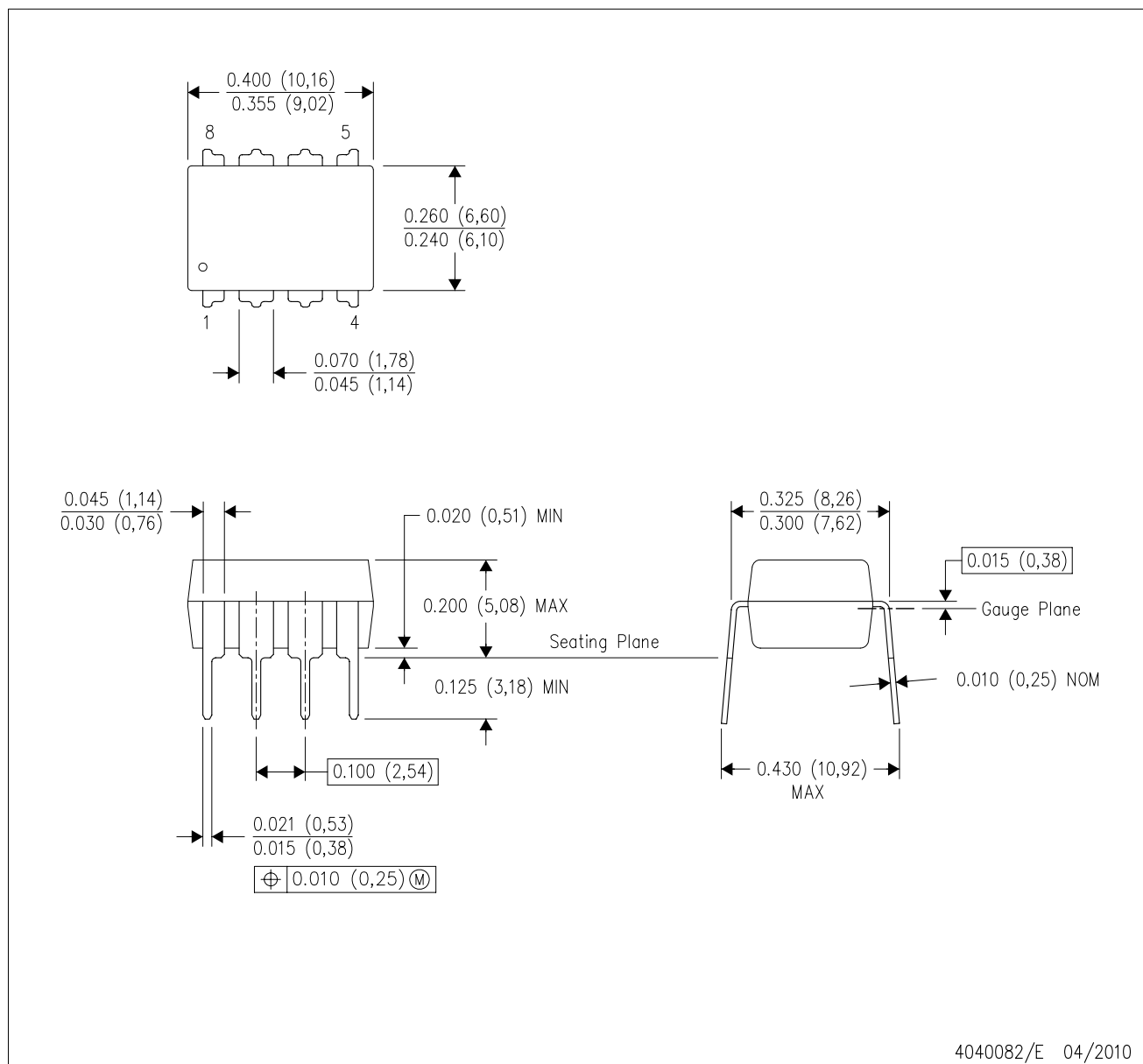


4040140/D 01/11

- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a metal lid.
  - Falls within JEDEC MS-004

P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE PACKAGE

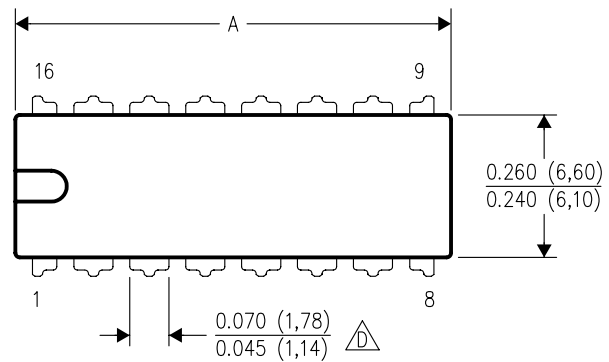


- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Falls within JEDEC MS-001 variation BA.

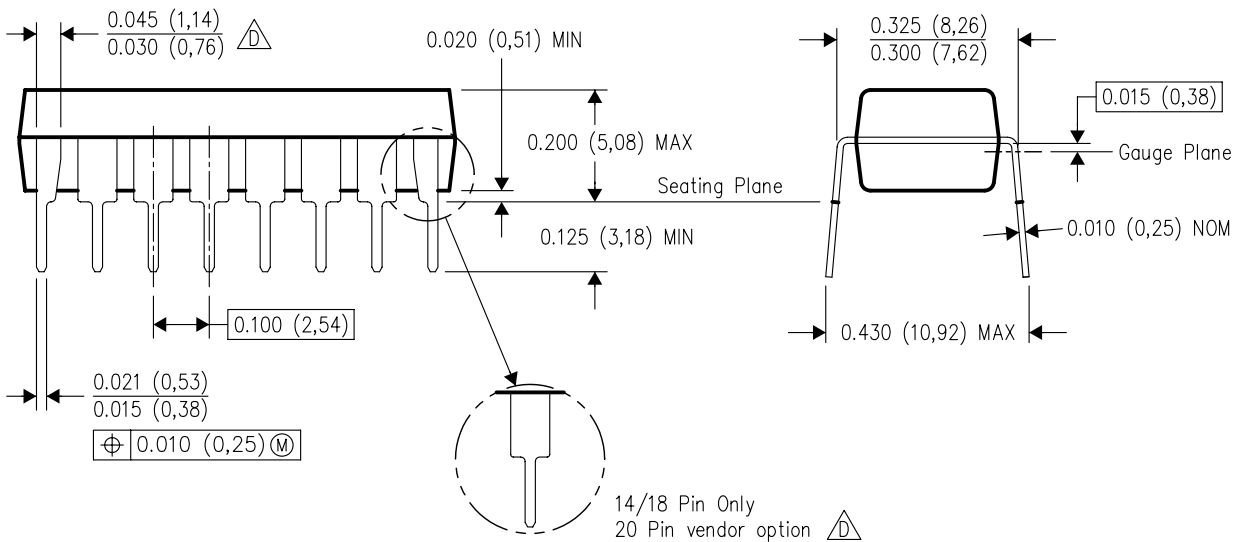
## N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



| PINS **             | 14               | 16               | 18               | 20               |
|---------------------|------------------|------------------|------------------|------------------|
| DIM                 |                  |                  |                  |                  |
| 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               |



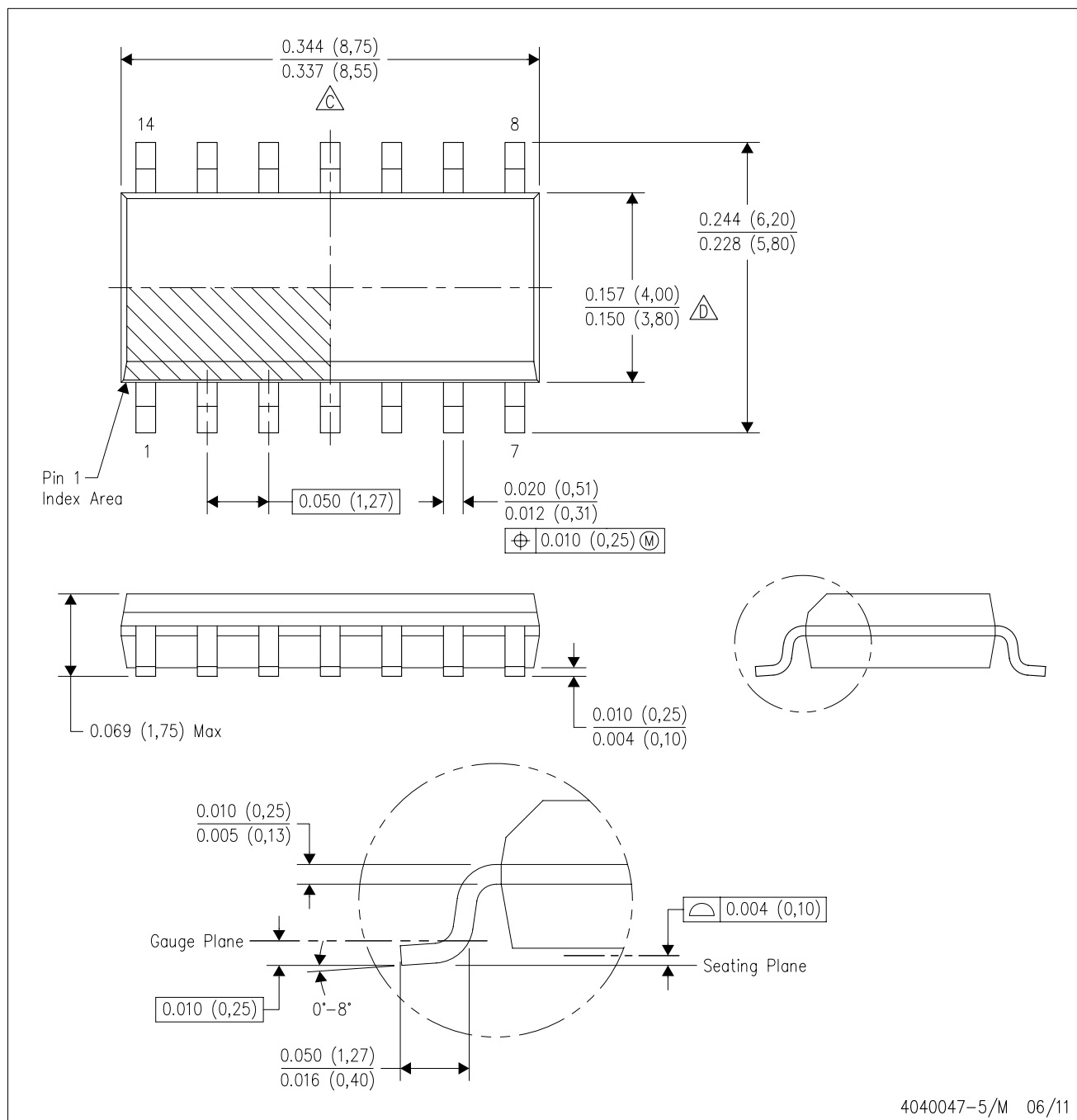
14/18 Pin Only  
20 Pin vendor option

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

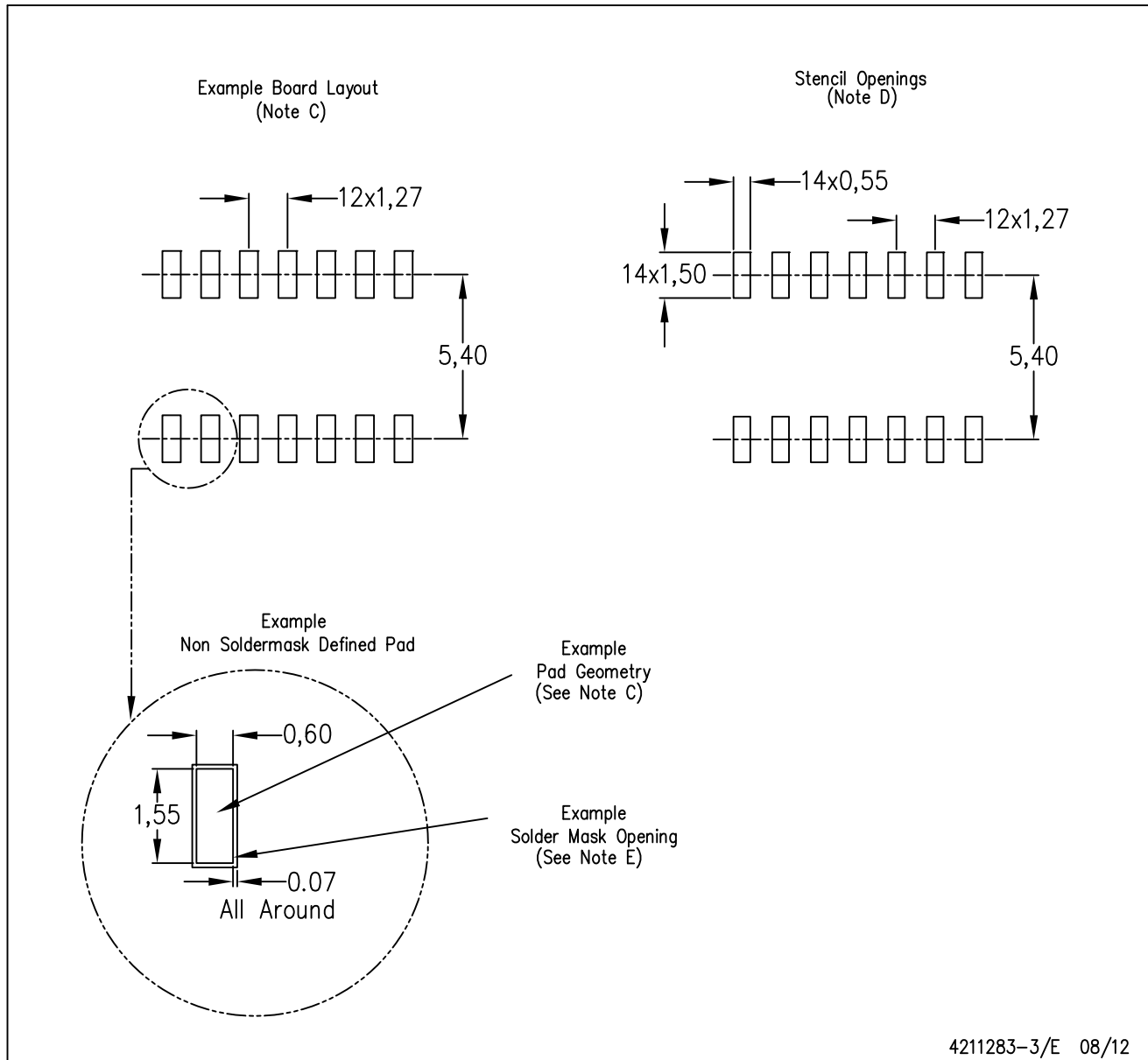


NOTES:

- 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-G14)

PLASTIC SMALL OUTLINE

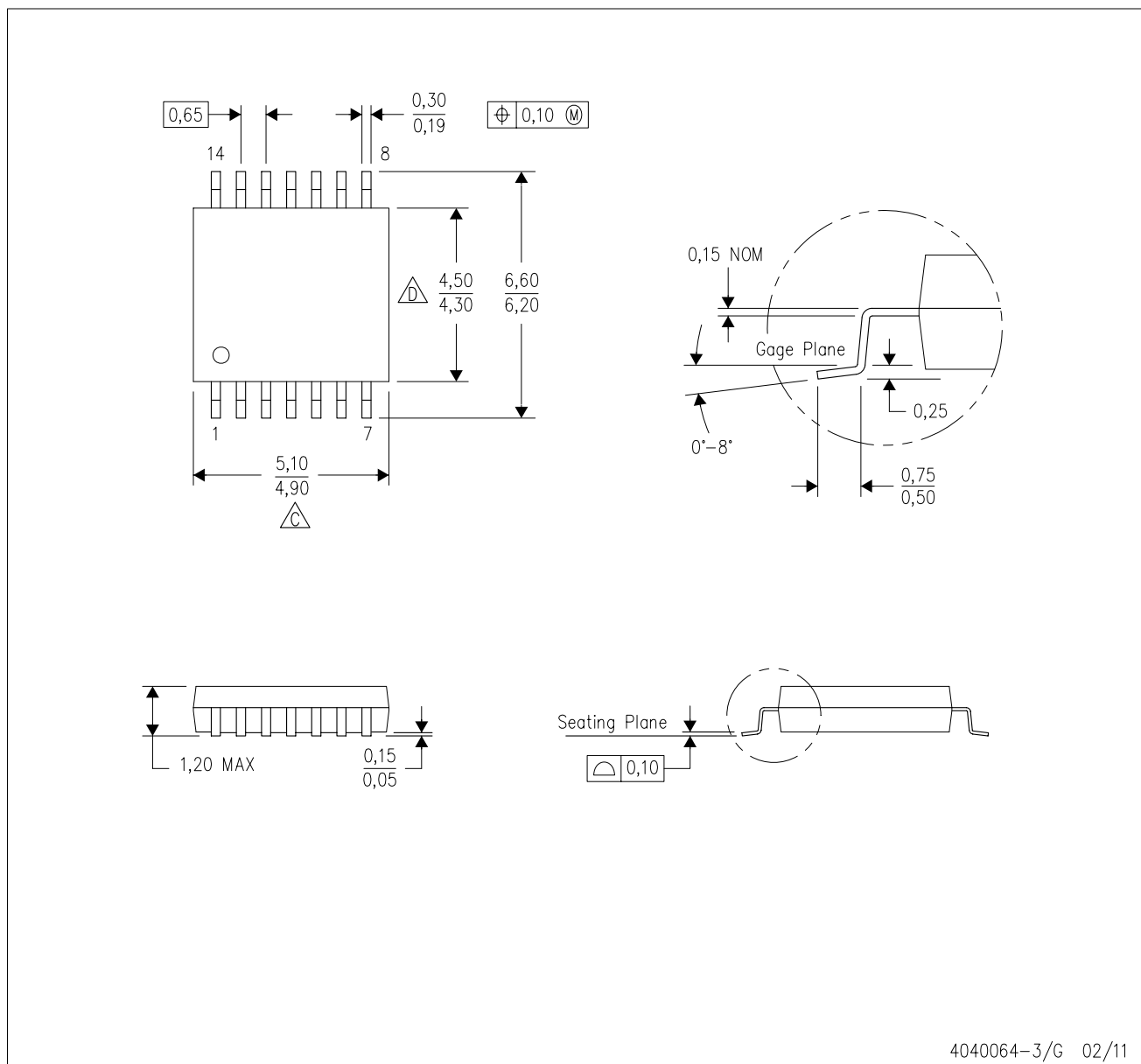


4211283-3/E 08/12

- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Publication IPC-7351 is recommended for alternate designs.
  - 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.
  - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

PW (R-PDSO-G14)

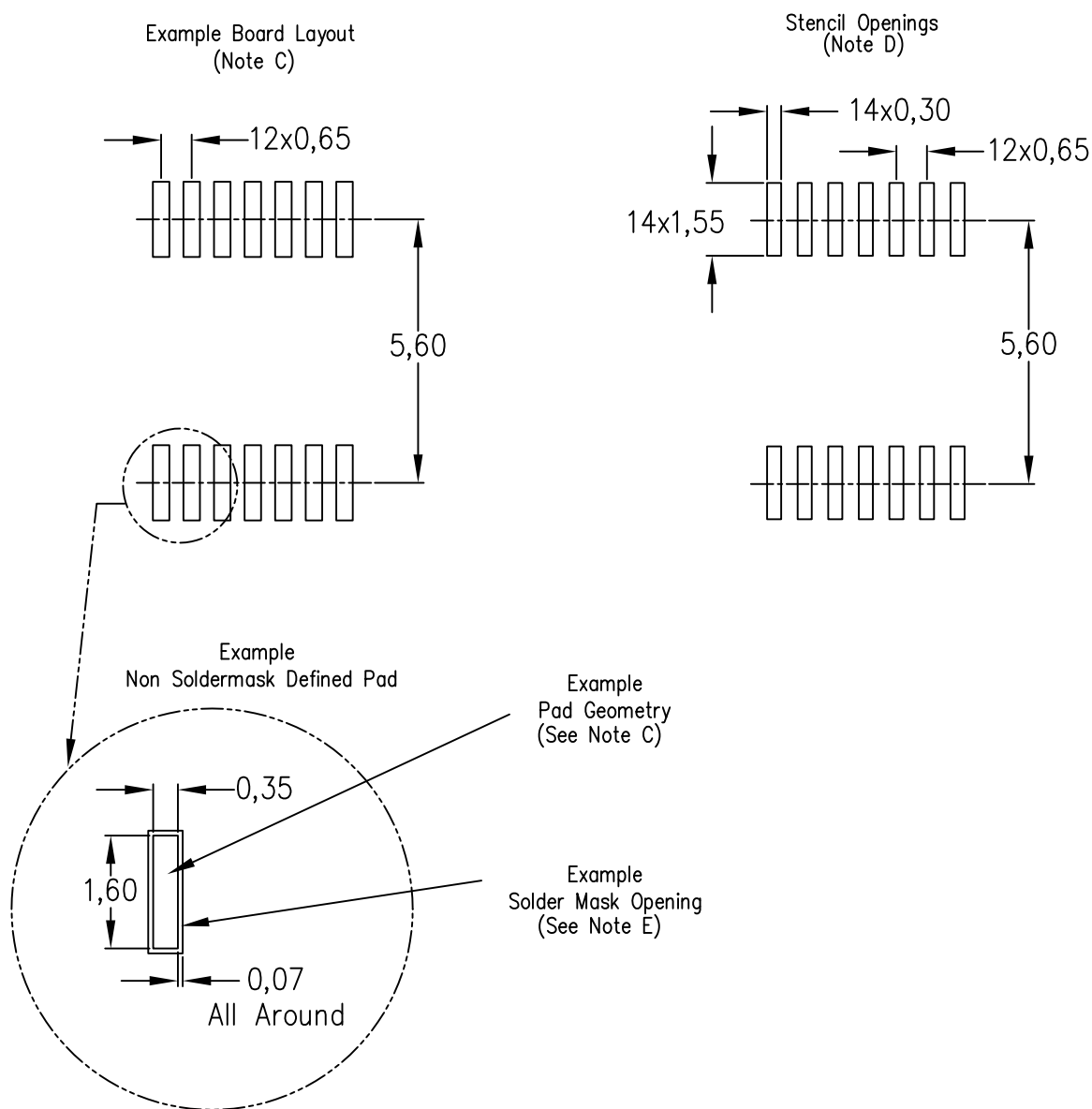
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - 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 0,15 each side.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
  - E. Falls within JEDEC MO-153

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE

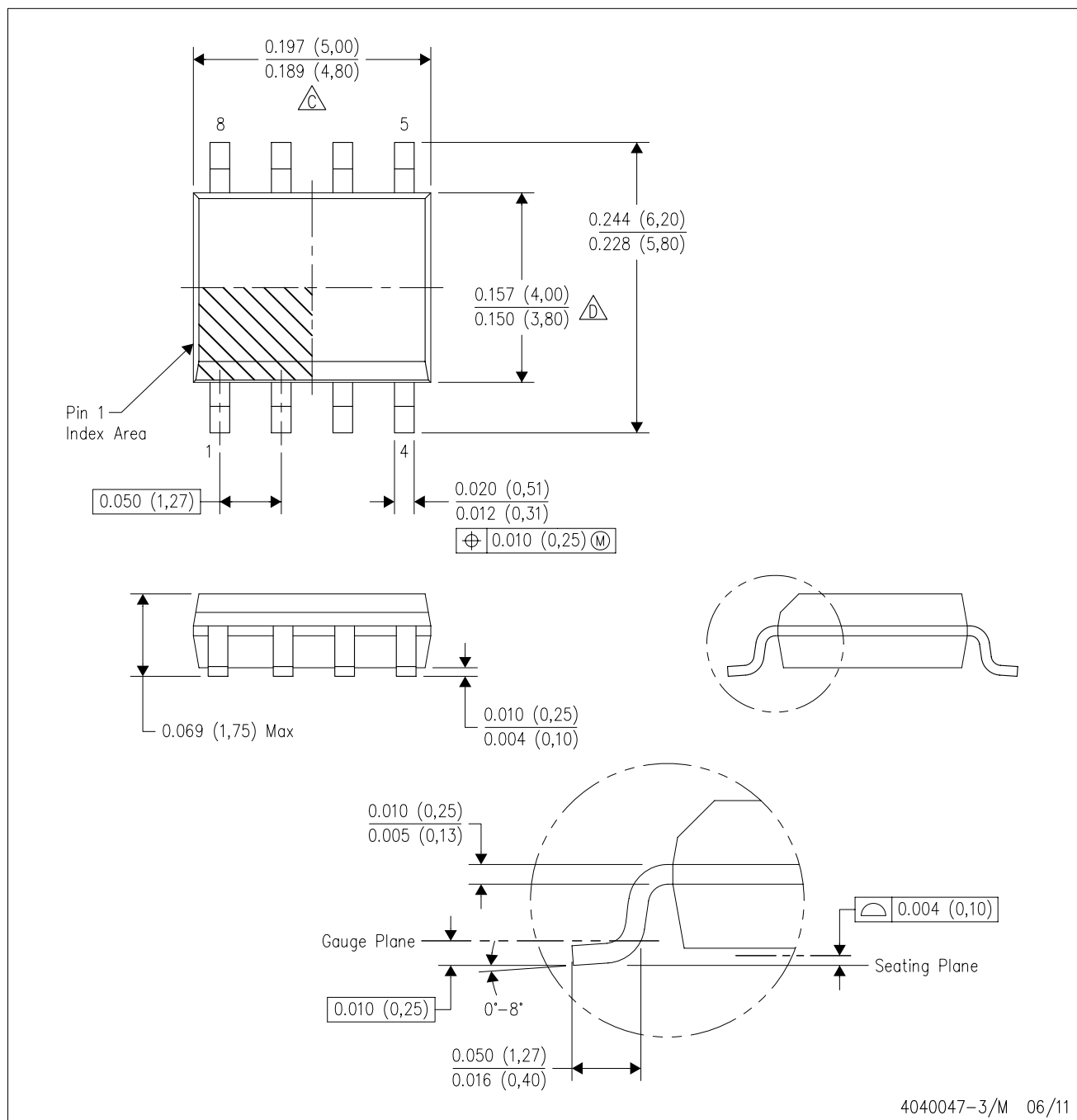


4211284-2/F 12/12

- 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.

D (R-PDSO-G8)

PLASTIC SMALL OUTLINE

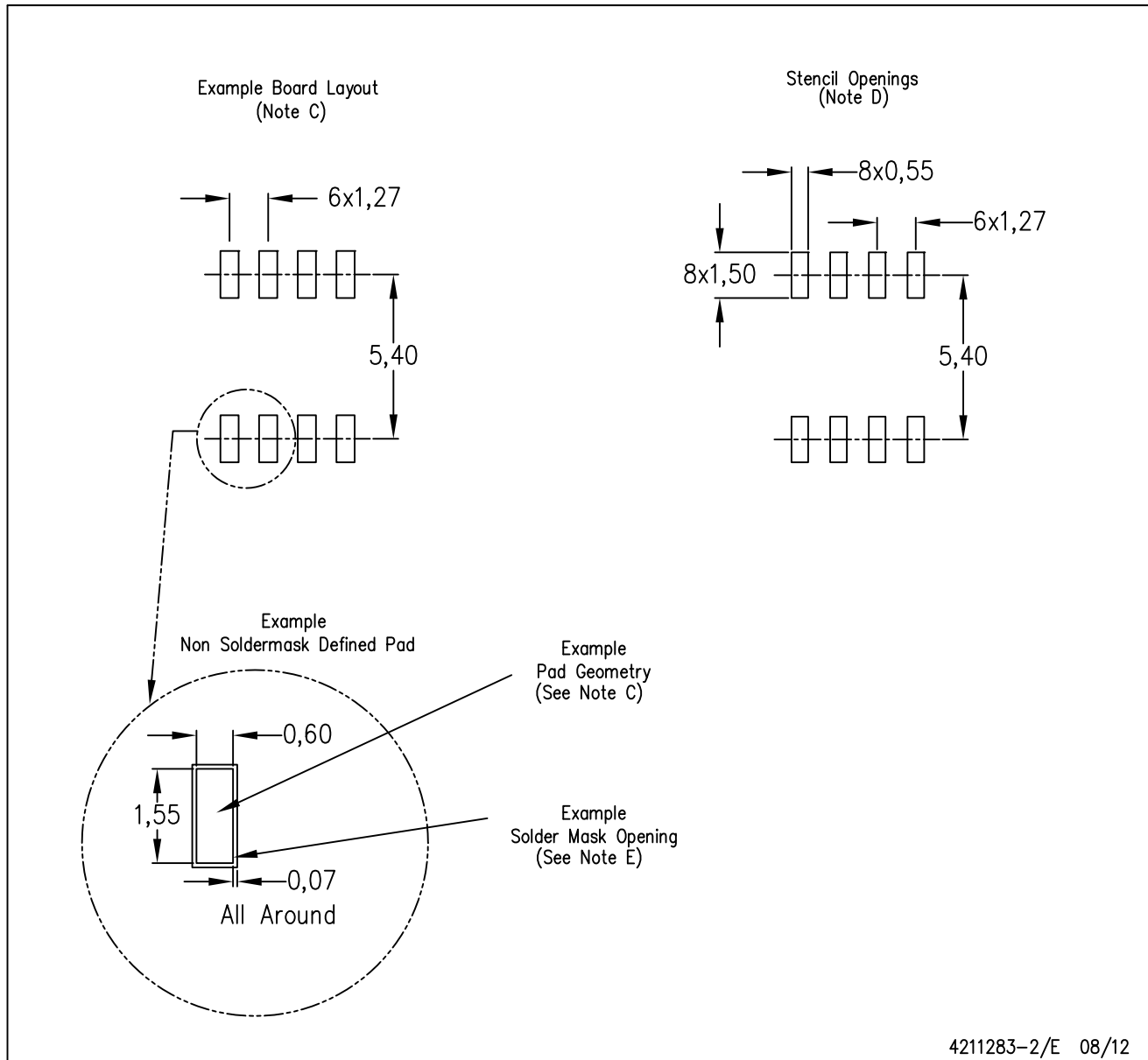


## NOTES:

- 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

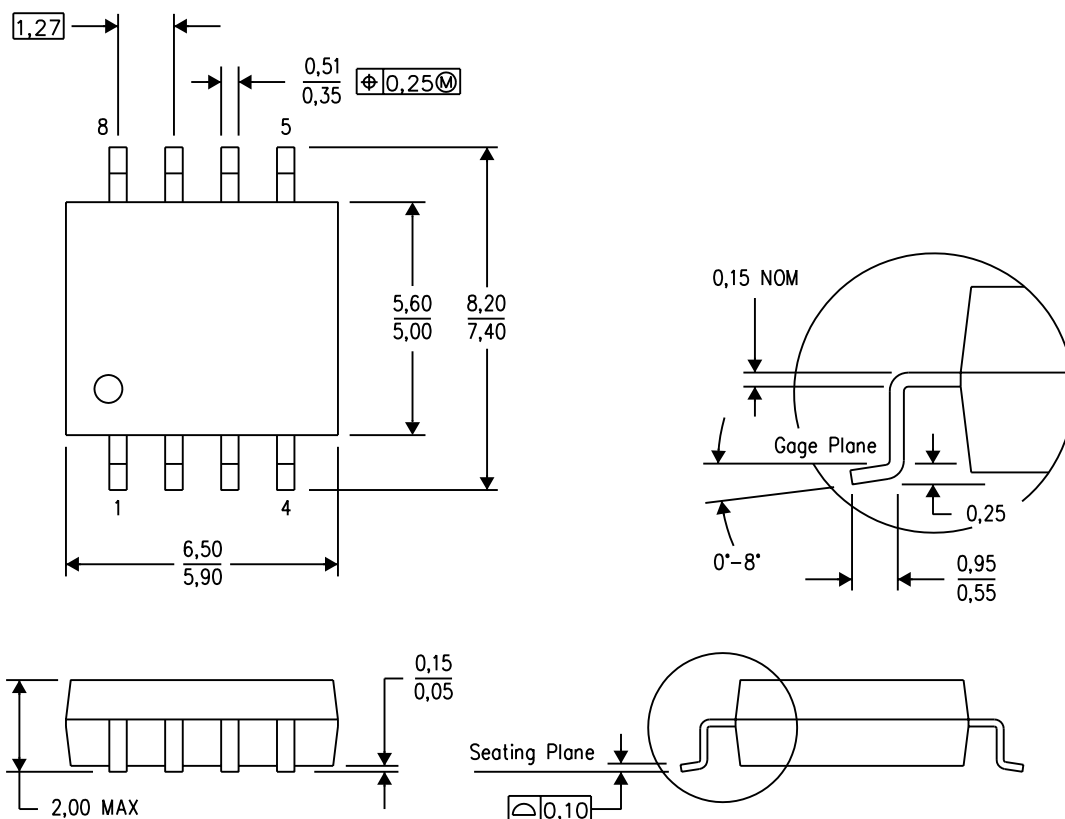


- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers 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

PS (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE

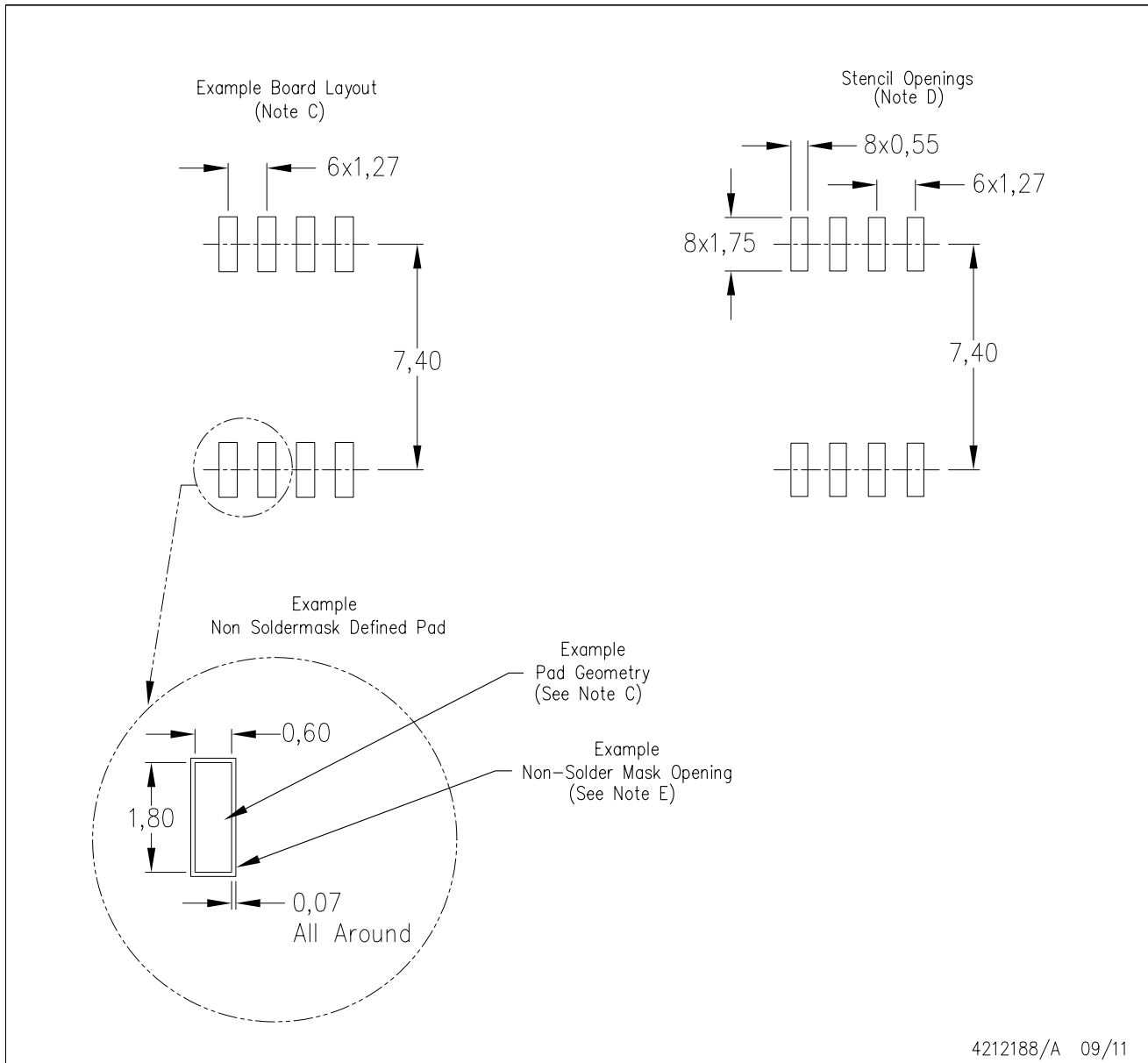


4040063/C 03/03

- 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.

## PS (R-PDSO-G8)

## PLASTIC SMALL OUTLINE



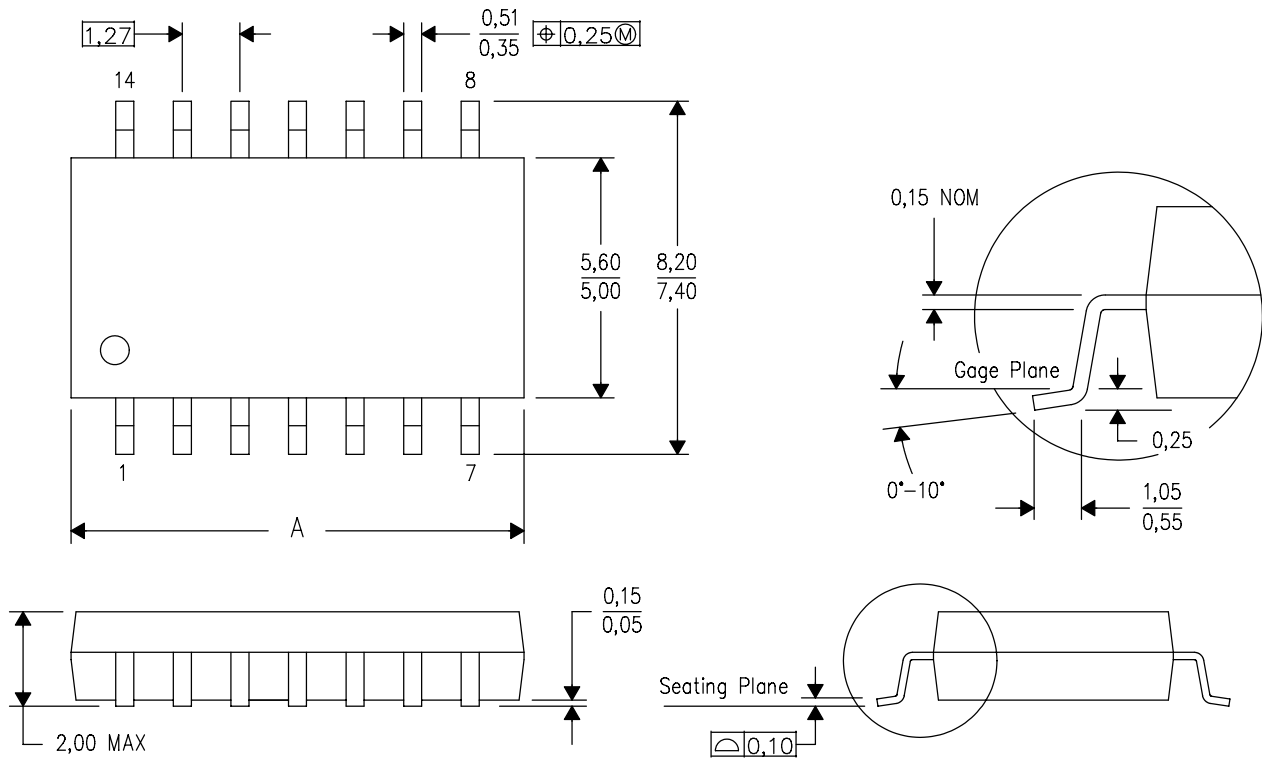
- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Publication IPC-7351 is recommended for alternate designs.
  - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact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



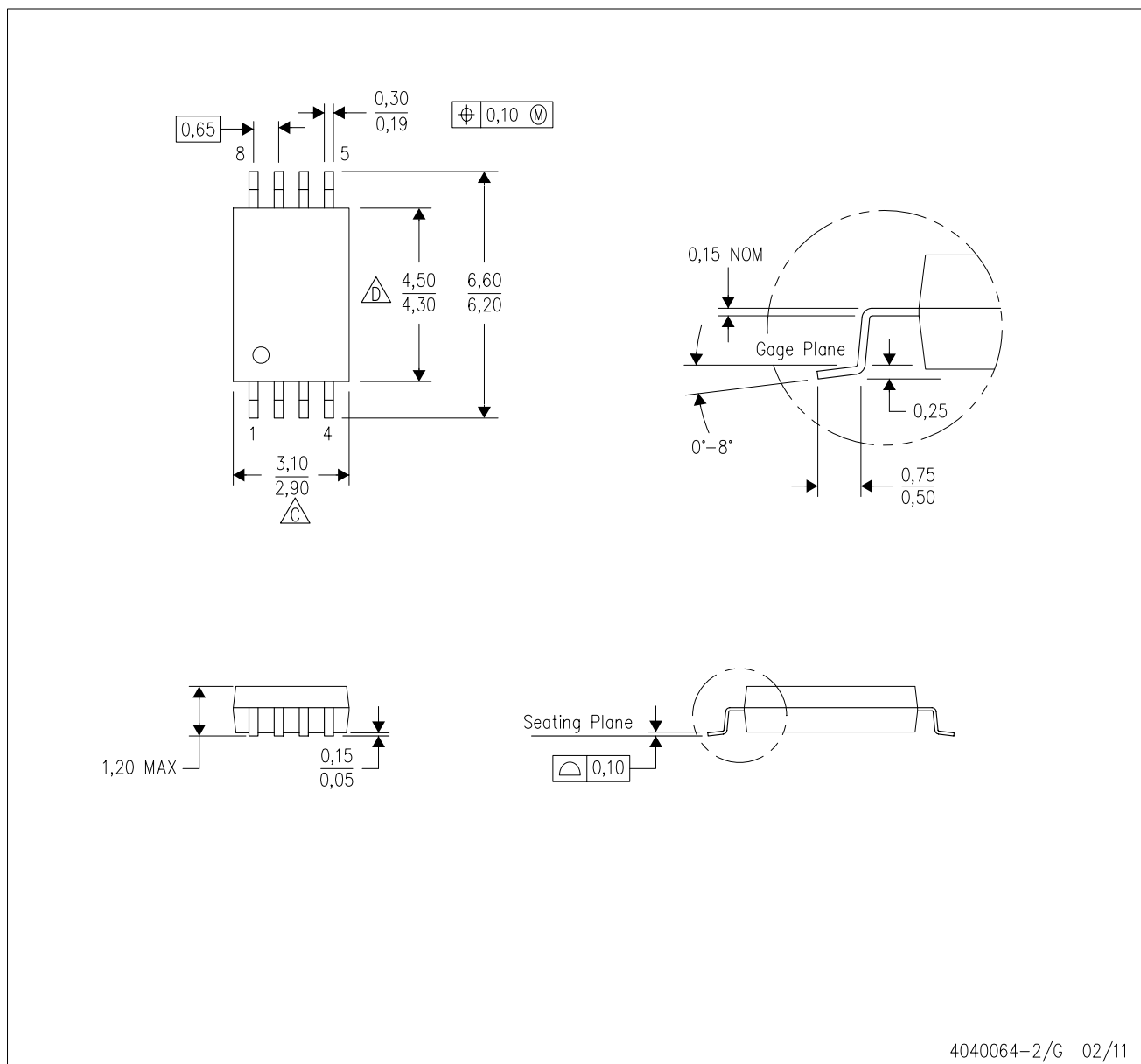
| DIM \ PINS ** | 14    | 16    | 20    | 24    |
|---------------|-------|-------|-------|-------|
| A MAX         | 10,50 | 10,50 | 12,90 | 15,30 |
| A MIN         | 9,90  | 9,90  | 12,30 | 14,70 |

4040062/C 03/03

- 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.

PW (R-PDSO-G8)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - 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 0,15 each side.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
  - E. Falls within JEDEC MO-153

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

### Products

|                              |                                                                                      |
|------------------------------|--------------------------------------------------------------------------------------|
| Audio                        | <a href="http://www.ti.com/audio">www.ti.com/audio</a>                               |
| Amplifiers                   | <a href="http://amplifier.ti.com">amplifier.ti.com</a>                               |
| Data Converters              | <a href="http://dataconverter.ti.com">dataconverter.ti.com</a>                       |
| DLP® Products                | <a href="http://www.dlp.com">www.dlp.com</a>                                         |
| DSP                          | <a href="http://dsp.ti.com">dsp.ti.com</a>                                           |
| Clocks and Timers            | <a href="http://www.ti.com/clocks">www.ti.com/clocks</a>                             |
| Interface                    | <a href="http://interface.ti.com">interface.ti.com</a>                               |
| Logic                        | <a href="http://logic.ti.com">logic.ti.com</a>                                       |
| Power Mgmt                   | <a href="http://power.ti.com">power.ti.com</a>                                       |
| Microcontrollers             | <a href="http://microcontroller.ti.com">microcontroller.ti.com</a>                   |
| RFID                         | <a href="http://www.ti-rfid.com">www.ti-rfid.com</a>                                 |
| OMAP Applications Processors | <a href="http://www.ti.com/omap">www.ti.com/omap</a>                                 |
| Wireless Connectivity        | <a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a> |

### Applications

|                               |                                                                                          |
|-------------------------------|------------------------------------------------------------------------------------------|
| Automotive and Transportation | <a href="http://www.ti.com/automotive">www.ti.com/automotive</a>                         |
| Communications and Telecom    | <a href="http://www.ti.com/communications">www.ti.com/communications</a>                 |
| Computers and Peripherals     | <a href="http://www.ti.com/computers">www.ti.com/computers</a>                           |
| Consumer Electronics          | <a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>                   |
| Energy and Lighting           | <a href="http://www.ti.com/energy">www.ti.com/energy</a>                                 |
| Industrial                    | <a href="http://www.ti.com/industrial">www.ti.com/industrial</a>                         |
| Medical                       | <a href="http://www.ti.com/medical">www.ti.com/medical</a>                               |
| Security                      | <a href="http://www.ti.com/security">www.ti.com/security</a>                             |
| Space, Avionics and Defense   | <a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a> |
| Video and Imaging             | <a href="http://www.ti.com/video">www.ti.com/video</a>                                   |

### TI E2E Community

[e2e.ti.com](http://e2e.ti.com)