

August 1998 - Revised May 2000

## 9-Bit Odd/Even Parity Generator/Checker

### Features

- **Buffered Inputs**
- **Typical Propagation Delay**
  - 10ns at  $V_{CC} = 5V$ ,  $T_A = 25^{\circ}C$ ,  $C_L = 50pF$
- **Exceeds 2kV ESD Protection per MIL-STD-883, Method 3015**
- **SCR-Latchup-Resistant CMOS Process and Circuit Design**
- **Speed of Bipolar FAST™/AS/S with Significantly Reduced Power Consumption**
- **Balanced Propagation Delays**
- **AC Types Feature 1.5V to 5.5V Operation and Balanced Noise Immunity at 30% of the Supply**
- **$\pm 24mA$  Output Drive Current**
  - Fanout to 15 FAST™ ICs
  - Drives 50 $\Omega$  Transmission Lines

### Description

The 'AC280 and 'ACT280 are 9-bit odd/even parity generator/checkers that utilize Advanced CMOS Logic technology. Both even and odd parity outputs are available for checking or generating parity for words up to nine bits long. Even parity is indicated ( $\Sigma E$  output is HIGH) when an even number of

data inputs is HIGH. Odd parity is indicated ( $\Sigma O$  output is HIGH) when an odd number of data inputs is HIGH. Parity checking for words larger than nine bits can be accomplished by tying the  $\Sigma E$  output to any input of an additional 'AC280, 'ACT280 parity checker.

### Ordering Information

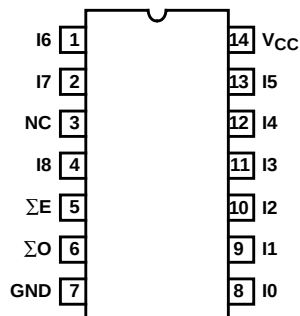
| PART NUMBER   | TEMP. RANGE ( $^{\circ}C$ )                 | PACKAGE      |
|---------------|---------------------------------------------|--------------|
| CD54AC280F3A  | -55 to 125                                  | 14 Ld Cerdip |
| CD74AC280E    | 0 to 70 $^{\circ}C$ , -40 to 85, -55 to 125 | 14 Ld PDIP   |
| CD74AC280M    | 0 to 70 $^{\circ}C$ , -40 to 85, -55 to 125 | 14 Ld SOIC   |
| CD54ACT280F3A | -55 to 125                                  | 14 Ld Cerdip |
| CD74ACT280E   | 0 to 70 $^{\circ}C$ , -40 to 85, -55 to 125 | 14 Ld PDIP   |
| CD74ACT280M   | 0 to 70 $^{\circ}C$ , -40 to 85, -55 to 125 | 14 Ld SOIC   |

#### NOTES:

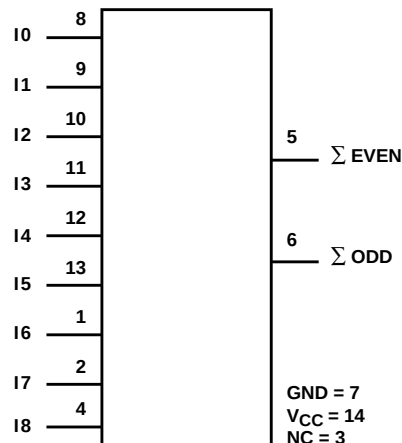
1. When ordering, use the entire part number. Add the suffix 96 to obtain the variant in the tape and reel.
2. Wafer and die for this part number is available which meets all electrical specifications. Please contact your local TI sales office or customer service for ordering information.

### Pinout

CD54AC280, CD54ACT280  
(CERDIP)  
CD74AC280, CD74ACT280  
(PDIP, SOIC)  
TOP VIEW



### Functional Diagram



CAUTION: These devices are sensitive to electrostatic discharge. Users should follow proper IC Handling Procedures.

# CD54/74AC280, CD54/74ACT280

## Absolute Maximum Ratings

DC Supply Voltage,  $V_{CC}$  ..... -0.5V to 6V  
 DC Input Diode Current,  $I_{IK}$   
     For  $V_I < -0.5V$  or  $V_I > V_{CC} + 0.5V$  .....  $\pm 20mA$   
 DC Output Diode Current,  $I_{OK}$   
     For  $V_O < -0.5V$  or  $V_O > V_{CC} + 0.5V$  .....  $\pm 50mA$   
 DC Output Source or Sink Current per Output Pin,  $I_O$   
     For  $V_O > -0.5V$  or  $V_O < V_{CC} + 0.5V$  .....  $\pm 50mA$   
 DC  $V_{CC}$  or Ground Current,  $I_{CC}$  or  $I_{GND}$  (Note 3) .....  $\pm 100mA$

## Thermal Information

Thermal Resistance (Typical, Note 5)  $\theta_{JA}$  ( $^{\circ}C/W$ )  
     PDIP Package .....  
     SOIC Package .....  
 Maximum Junction Temperature (Plastic Package) .....  $150^{\circ}C$   
 Maximum Storage Temperature Range .....  $-65^{\circ}C$  to  $150^{\circ}C$   
 Maximum Lead Temperature (Soldering 10s) .....  $300^{\circ}C$

## Operating Conditions

Temperature Range,  $T_A$  .....  $-55^{\circ}C$  to  $125^{\circ}C$   
 Supply Voltage Range,  $V_{CC}$  (Note 4)  
     AC Types ..... 1.5V to 5.5V  
     ACT Types ..... 4.5V to 5.5V  
 DC Input or Output Voltage,  $V_I$ ,  $V_O$  ..... 0V to  $V_{CC}$   
 Input Rise and Fall Slew Rate,  $dt/dv$   
     AC Types, 1.5V to 3V ..... 50ns (Max)  
     AC Types, 3.6V to 5.5V ..... 20ns (Max)  
     ACT Types, 4.5V to 5.5V ..... 10ns (Max)

**CAUTION:** Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

### NOTES:

- For up to 4 outputs per device, add  $\pm 25mA$  for each additional output.
- Unless otherwise specified, all voltages are referenced to ground.
- $\theta_{JA}$  is measured with the component mounted on an evaluation PC board in free air.

## DC Electrical Specifications

| PARAMETER                 | SYMBOL          | TEST CONDITIONS                    |                     | V <sub>CC</sub> (V) | 25°C |      | -40°C TO 85°C |      | -55°C TO 125°C |      | UNITS |
|---------------------------|-----------------|------------------------------------|---------------------|---------------------|------|------|---------------|------|----------------|------|-------|
|                           |                 | V <sub>I</sub> (V)                 | I <sub>O</sub> (mA) |                     | MIN  | MAX  | MIN           | MAX  | MIN            | MAX  |       |
| AC TYPES                  |                 |                                    |                     |                     |      |      |               |      |                |      |       |
| High Level Input Voltage  | V <sub>IH</sub> | -                                  | -                   | 1.5                 | 1.2  | -    | 1.2           | -    | 1.2            | -    | V     |
|                           |                 |                                    |                     | 3                   | 2.1  | -    | 2.1           | -    | 2.1            | -    | V     |
|                           |                 |                                    |                     | 5.5                 | 3.85 | -    | 3.85          | -    | 3.85           | -    | V     |
| Low Level Input Voltage   | V <sub>IL</sub> | -                                  | -                   | 1.5                 | -    | 0.3  | -             | 0.3  | -              | 0.3  | V     |
|                           |                 |                                    |                     | 3                   | -    | 0.9  | -             | 0.9  | -              | 0.9  | V     |
|                           |                 |                                    |                     | 5.5                 | -    | 1.65 | -             | 1.65 | -              | 1.65 | V     |
| High Level Output Voltage | V <sub>OH</sub> | V <sub>IH</sub> or V <sub>IL</sub> | -0.05               | 1.5                 | 1.4  | -    | 1.4           | -    | 1.4            | -    | V     |
|                           |                 |                                    | -0.05               | 3                   | 2.9  | -    | 2.9           | -    | 2.9            | -    | V     |
|                           |                 |                                    | -0.05               | 4.5                 | 4.4  | -    | 4.4           | -    | 4.4            | -    | V     |
|                           |                 |                                    | -4                  | 3                   | 2.58 | -    | 2.48          | -    | 2.4            | -    | V     |
|                           |                 |                                    | -24                 | 4.5                 | 3.94 | -    | 3.8           | -    | 3.7            | -    | V     |
|                           |                 |                                    | -75<br>(Note 6, 7)  | 5.5                 | -    | -    | 3.85          | -    | -              | -    | V     |
|                           |                 |                                    | -50<br>(Note 6, 7)  | 5.5                 | -    | -    | -             | -    | 3.85           | -    | V     |

**CD54/74AC280, CD54/74ACT280**

**DC Electrical Specifications (Continued)**

| PARAMETER                                                           | SYMBOL           | TEST CONDITIONS                    |                     | V <sub>CC</sub><br>(V) | 25°C |      | -40°C TO 85°C |      | -55°C TO 125°C |      | UNITS |
|---------------------------------------------------------------------|------------------|------------------------------------|---------------------|------------------------|------|------|---------------|------|----------------|------|-------|
|                                                                     |                  | V <sub>I</sub> (V)                 | I <sub>O</sub> (mA) |                        | MIN  | MAX  | MIN           | MAX  | MIN            | MAX  |       |
| Low Level Output Voltage                                            | V <sub>OL</sub>  | V <sub>IH</sub> or V <sub>IL</sub> | 0.05                | 1.5                    | -    | 0.1  | -             | 0.1  | -              | 0.1  | V     |
|                                                                     |                  |                                    | 0.05                | 3                      | -    | 0.1  | -             | 0.1  | -              | 0.1  | V     |
|                                                                     |                  |                                    | 0.05                | 4.5                    | -    | 0.1  | -             | 0.1  | -              | 0.1  | V     |
|                                                                     |                  |                                    | 12                  | 3                      | -    | 0.36 | -             | 0.44 | -              | 0.5  | V     |
|                                                                     |                  |                                    | 24                  | 4.5                    | -    | 0.36 | -             | 0.44 | -              | 0.5  | V     |
|                                                                     |                  |                                    | 75<br>(Note 6, 7)   | 5.5                    | -    | -    | -             | 1.65 | -              | -    | V     |
|                                                                     |                  |                                    | 50<br>(Note 6, 7)   | 5.5                    | -    | -    | -             | -    | -              | 1.65 | V     |
| Input Leakage Current                                               | I <sub>I</sub>   | V <sub>CC</sub> or GND             | -                   | 5.5                    | -    | ±0.1 | -             | ±1   | -              | ±1   | μA    |
| Quiescent Supply Current MSI                                        | I <sub>CC</sub>  | V <sub>CC</sub> or GND             | 0                   | 5.5                    | -    | 8    | -             | 80   | -              | 160  | μA    |
| <b>ACT TYPES</b>                                                    |                  |                                    |                     |                        |      |      |               |      |                |      |       |
| High Level Input Voltage                                            | V <sub>IH</sub>  | -                                  | -                   | 4.5 to 5.5             | 2    | -    | 2             | -    | 2              | -    | V     |
| Low Level Input Voltage                                             | V <sub>IL</sub>  | -                                  | -                   | 4.5 to 5.5             | -    | 0.8  | -             | 0.8  | -              | 0.8  | V     |
| High Level Output Voltage                                           | V <sub>OH</sub>  | V <sub>IH</sub> or V <sub>IL</sub> | -0.05               | 4.5                    | 4.4  | -    | 4.4           | -    | 4.4            | -    | V     |
|                                                                     |                  |                                    | -24                 | 4.5                    | 3.94 | -    | 3.8           | -    | 3.7            | -    | V     |
|                                                                     |                  |                                    | -75<br>(Note 6, 7)  | 5.5                    | -    | -    | 3.85          | -    | -              | -    | V     |
|                                                                     |                  |                                    | -50<br>(Note 6, 7)  | 5.5                    | -    | -    | -             | -    | 3.85           | -    | V     |
| Low Level Output Voltage                                            | V <sub>OL</sub>  | V <sub>IH</sub> or V <sub>IL</sub> | 0.05                | 4.5                    | -    | 0.1  | -             | 0.1  | -              | 0.1  | V     |
|                                                                     |                  |                                    | 24                  | 4.5                    | -    | 0.36 | -             | 0.44 | -              | 0.5  | V     |
|                                                                     |                  |                                    | 75<br>(Note 6, 7)   | 5.5                    | -    | -    | -             | 1.65 | -              | -    | V     |
|                                                                     |                  |                                    | 50<br>(Note 6, 7)   | 5.5                    | -    | -    | -             | -    | -              | 1.65 | V     |
| Input Leakage Current                                               | I <sub>I</sub>   | V <sub>CC</sub> or GND             | -                   | 5.5                    | -    | ±0.1 | -             | ±1   | -              | ±1   | μA    |
| Quiescent Supply Current MSI                                        | I <sub>CC</sub>  | V <sub>CC</sub> or GND             | 0                   | 5.5                    | -    | 8    | -             | 80   | -              | 160  | μA    |
| Additional Supply Current per Input Pin TTL Inputs High 1 Unit Load | ΔI <sub>CC</sub> | V <sub>CC</sub> -2.1               | -                   | 4.5 to 5.5             | -    | 2.4  | -             | 2.8  | -              | 3    | mA    |

**NOTES:**

- Test one output at a time for a 1-second maximum duration. Measurement is made by forcing current and measuring voltage to minimize power dissipation.
- Test verifies a minimum 50Ω transmission-line-drive capability at 85°C, 75Ω at 125°C.

**ACT Input Load Table**

| INPUT | UNIT LOAD |
|-------|-----------|
| All   | 1.43      |

NOTE: Unit load is ΔI<sub>CC</sub> limit specified in DC Electrical Specifications Table, e.g., 2.4mA max at 25°C.

# CD54/74AC280, CD54/74ACT280

## Switching Specifications Input $t_r, t_f = 3\text{ns}$ , $C_L = 50\text{pF}$ (Worst Case)

| PARAMETER                             | SYMBOL                              | V <sub>CC</sub> (V) | -40°C TO 85°C |     |      | -55°C TO 125°C |     |      | UNITS |
|---------------------------------------|-------------------------------------|---------------------|---------------|-----|------|----------------|-----|------|-------|
|                                       |                                     |                     | MIN           | TYP | MAX  | MIN            | TYP | MAX  |       |
| AC TYPES                              |                                     |                     |               |     |      |                |     |      |       |
| Propagation Delay,<br>Any Input to ΣO | t <sub>PLH</sub> , t <sub>PHL</sub> | 1.5                 | -             | -   | 239  | -              | -   | 263  | ns    |
|                                       |                                     | 3.3<br>(Note 9)     | 7.5           | -   | 26   | 7.3            | -   | 29   | ns    |
|                                       |                                     | 5<br>(Note 10)      | 5.4           | -   | 19.1 | 5.3            | -   | 21   | ns    |
| Propagation Delay,<br>Any Input to ΣE | t <sub>PLH</sub> , t <sub>PHL</sub> | 1.5                 | -             | -   | 227  | -              | -   | 250  | ns    |
|                                       |                                     | 3.3                 | 7.2           | -   | 25   | 7              | -   | 28   | ns    |
|                                       |                                     | 5                   | 5.2           | -   | 18.2 | 5              | -   | 20   | ns    |
| Input Capacitance                     | C <sub>I</sub>                      | -                   | -             | -   | 10   | -              | -   | 10   | pF    |
| Power Dissipation Capacitance         | C <sub>PD</sub><br>(Note 11)        | -                   | -             | 115 | -    | -              | 115 | -    | pF    |
| ACT TYPES                             |                                     |                     |               |     |      |                |     |      |       |
| Propagation Delay,<br>Any Input to ΣO | t <sub>PLH</sub> , t <sub>PHL</sub> | 5<br>(Note 10)      | 5.6           | -   | 19.6 | 5.4            | -   | 21.6 | ns    |
| Propagation Delay,<br>Any Input to ΣE | t <sub>PLH</sub> , t <sub>PHL</sub> | 5                   | 5.6           | -   | 19.6 | 5.4            | -   | 21.6 | ns    |
| Input Capacitance                     | C <sub>I</sub>                      | -                   | -             | -   | 10   | -              | -   | 10   | pF    |
| Power Dissipation Capacitance         | C <sub>PD</sub><br>(Note 11)        | -                   | -             | 115 | -    | -              | 115 | -    | pF    |

### NOTES:

8. Limits tested 100%
9. 3.3V Min is at 3.6V, Max is at 3V.
10. 5V Min is at 5.5V, Max is at 4.5V.
11.  $C_{PD}$  is used to determine the dynamic power consumption per package.  
 AC:  $P_D = V_{CC}^2 f_i (C_{PD} + C_L)$   
 ACT:  $P_D = V_{CC}^2 f_i (C_{PD} + C_L) + V_{CC} \Delta I_{CC}$  where  $f_i$  = input frequency,  $C_L$  = output load capacitance,  $V_{CC}$  = supply voltage.

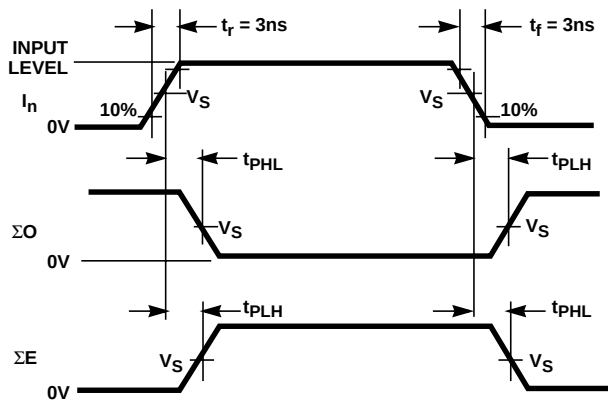
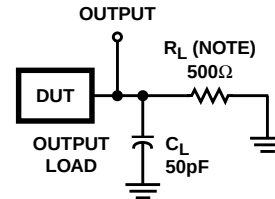


FIGURE 1.



NOTE: For AC Series Only: When  $V_{CC} = 1.5\text{V}$ ,  $R_L = 1\text{k}\Omega$ .

|                                 | AC           | ACT          |
|---------------------------------|--------------|--------------|
| Input Level                     | $V_{CC}$     | 3V           |
| Input Switching Voltage, $V_S$  | $0.5 V_{CC}$ | 1.5V         |
| Output Switching Voltage, $V_S$ | $0.5 V_{CC}$ | $0.5 V_{CC}$ |

FIGURE 2. PROPAGATION DELAY TIMES

**PACKAGING INFORMATION**

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup>               |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|--------------------------------------------|
| CD54AC280F3A     | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | Call TI          | Level-NC-NC-NC                             |
| CD54ACT280F3A    | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | Call TI          | Level-NC-NC-NC                             |
| CD74AC280E       | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC                             |
| CD74AC280M       | ACTIVE                | SOIC         | D               | 14   | 50          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| CD74AC280M96     | ACTIVE                | SOIC         | D               | 14   | 2500        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| CD74AC280M96E4   | ACTIVE                | SOIC         | D               | 14   | 2500        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| CD74AC280ME4     | ACTIVE                | SOIC         | D               | 14   | 50          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| CD74ACT280E      | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC                             |
| CD74ACT280EE4    | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC                             |
| CD74ACT280M      | ACTIVE                | SOIC         | D               | 14   | 50          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| CD74ACT280M96    | ACTIVE                | SOIC         | D               | 14   | 2500        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| CD74ACT280M96E4  | ACTIVE                | SOIC         | D               | 14   | 2500        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| CD74ACT280ME4    | ACTIVE                | SOIC         | D               | 14   | 50          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |

<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) or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

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

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

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

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

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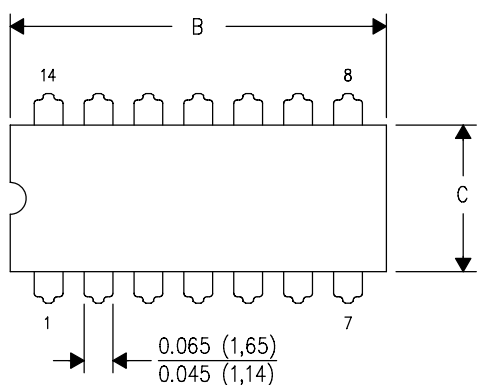
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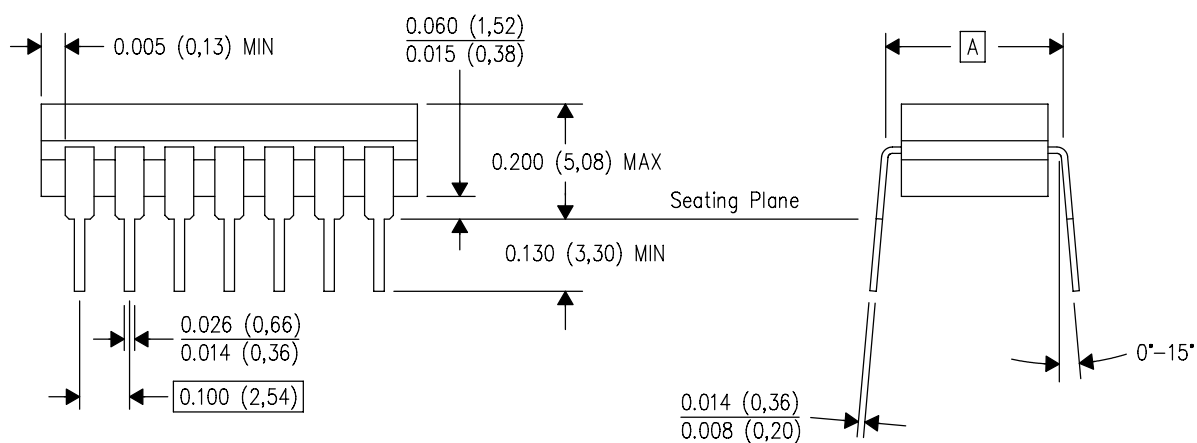
J (R-GDIP-T\*\*)

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)        |



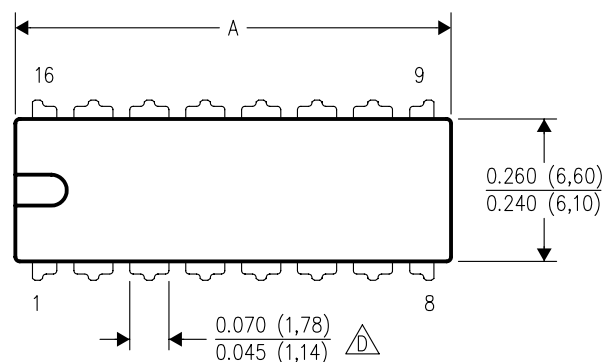
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- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package is hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal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

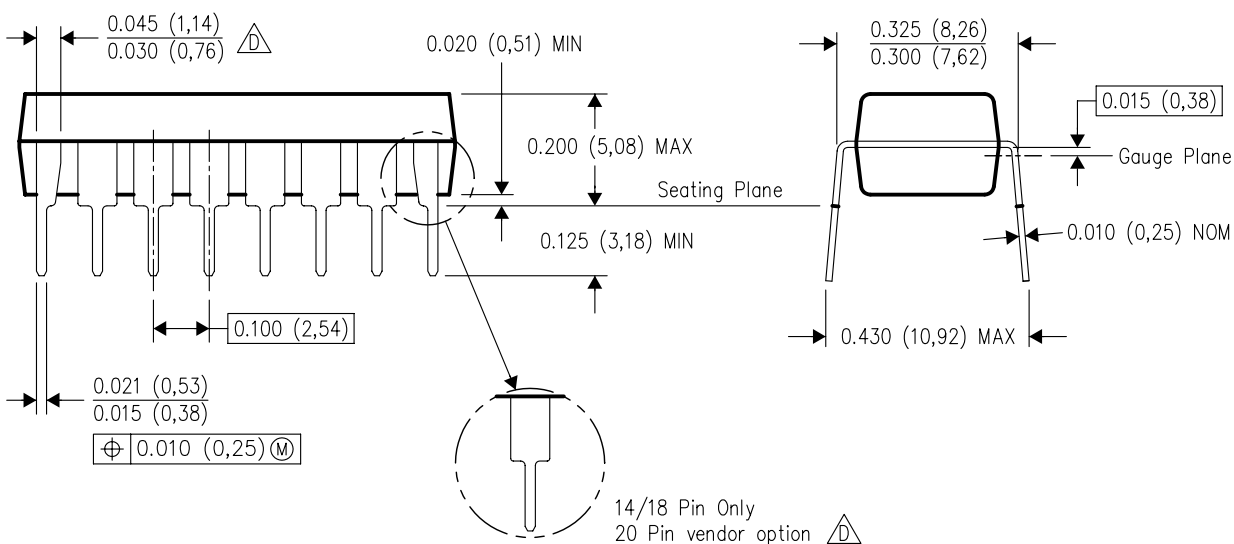
N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



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



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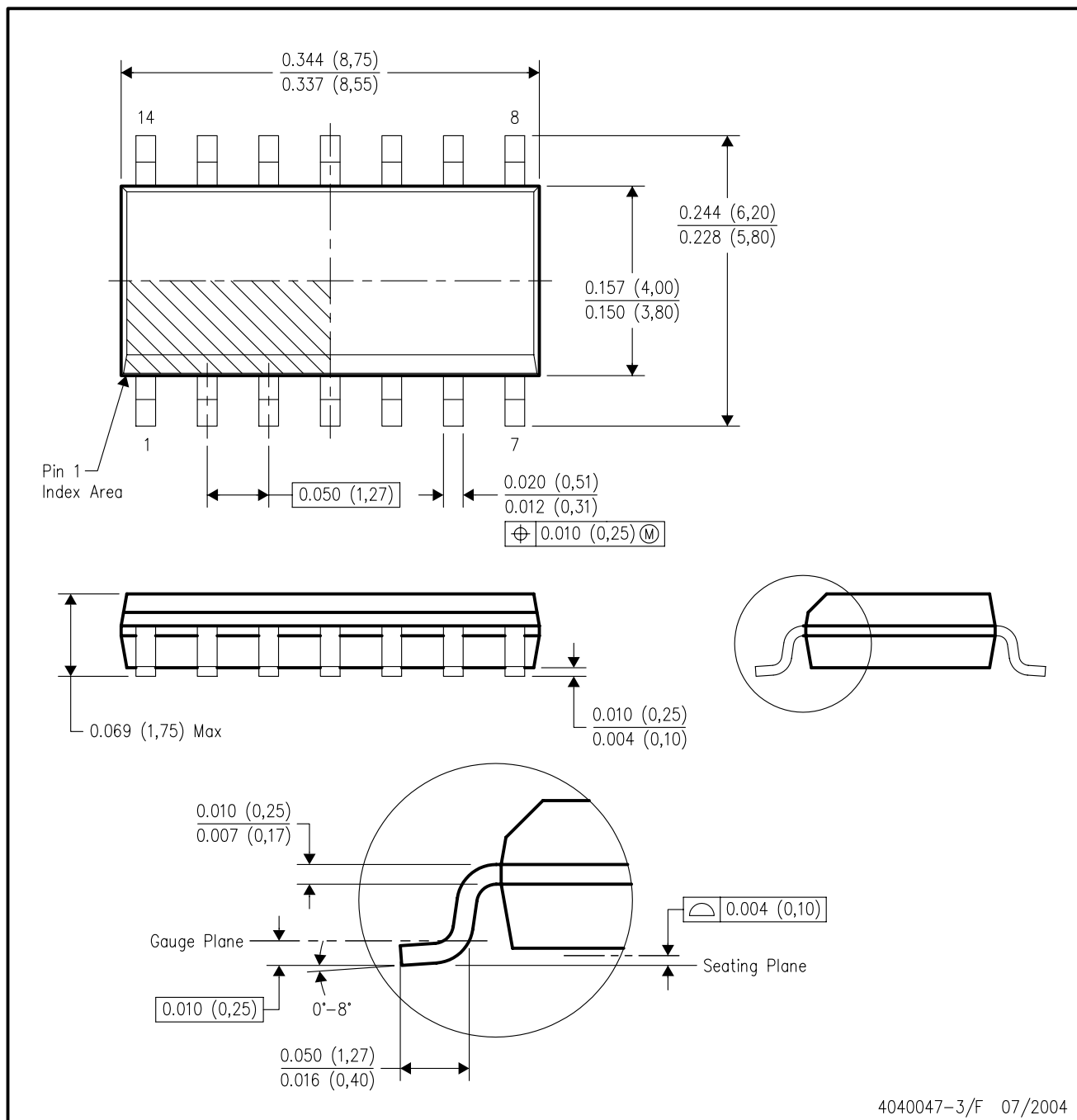
NOTES:

- 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 PACKAGE



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

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Mailing Address: Texas Instruments  
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