

# SN54LS592, SN54LS593, SN74LS592, SN74LS593 8-BIT BINARY COUNTERS WITH INPUT REGISTERS

SDLS004

D2633, JANUARY 1981—REVISED MARCH 1988

- Parallel Register Inputs ('LS592)
- Parallel 3-State I/O: Register Inputs/Counter Outputs ('LS593)
- Counter has Direct Overriding Load and Clear
- Accurate Counter Frequency: DC to 20 MHz

## description

The 'LS592 comes in a 16-pin package and consists of a parallel input, 8-bit storage register feeding an 8-bit binary counter. Both the register and the counter have individual positive-edge-triggered clocks. In addition, the counter has direct load and clear functions. A low-going  $\overline{RCO}$  pulse will be obtained when the counter reaches the hex word FF. Expansion is easily accomplished for two stages by connecting  $\overline{RCO}$  of the first stage to  $\overline{CCKEN}$  of the second stage. Cascading for larger count chains can be accomplished by connecting  $\overline{RCO}$  of each stage to CCK of the following stage.

The 'LS593 comes in a 20-pin package and has all the features of the 'LS592 plus 3-state I/O, which provides parallel counter outputs. The tables below show the operation of the enable (CCKEN,  $\overline{CCKEN}$ ) inputs. A register clock enable (RCKEN) is also provided.

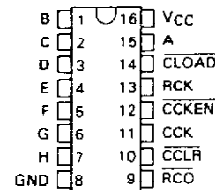
### OUTPUT ENABLE CONTROL ('593 ONLY)

| G | $\overline{G}$ | A/Q <sub>A</sub> thru H/Q <sub>H</sub> |
|---|----------------|----------------------------------------|
| L | L              | input mode                             |
| L | H              | input mode                             |
| H | L              | output mode                            |
| H | H              | input mode                             |

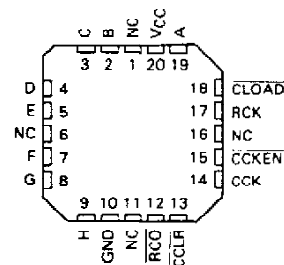
### COUNTER CLOCK ENABLE CONTROL

| CCKEN | $\overline{CCKEN}$ | EFFECT ON CCK |
|-------|--------------------|---------------|
| L     | L                  | Enable        |
| L     | H                  | Disable       |
| H     | L                  | Enable        |
| H     | H                  | Enable        |

### SN54LS592 . . . J OR W PACKAGE SN74LS592 . . . N PACKAGE (TOP VIEW)

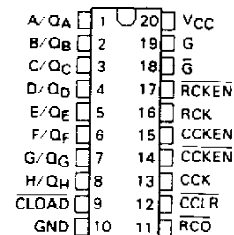


### SN54LS592 . . . FK PACKAGE (TOP VIEW)

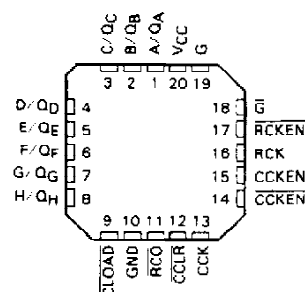


NC — No internal connection

### SN54LS593 . . . J OR W PACKAGE SN74LS593 . . . DW OR N PACKAGE (TOP VIEW)



### SN54LS593 . . . FK PACKAGE (TOP VIEW)



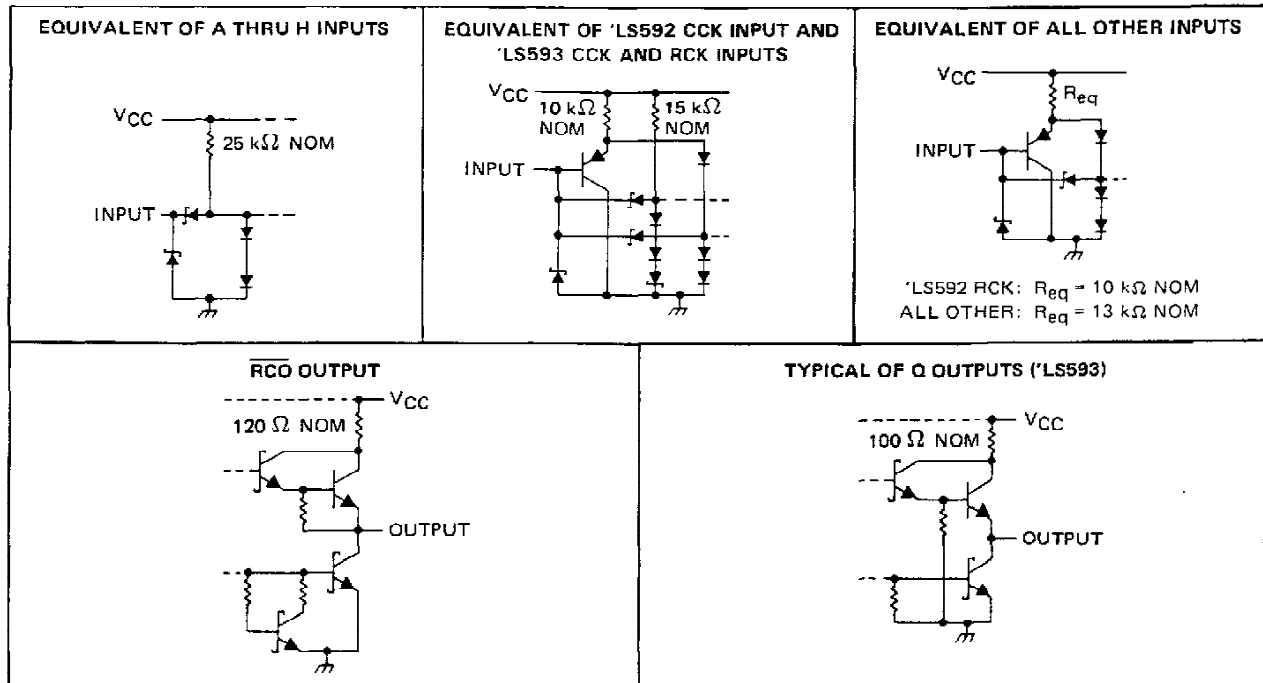
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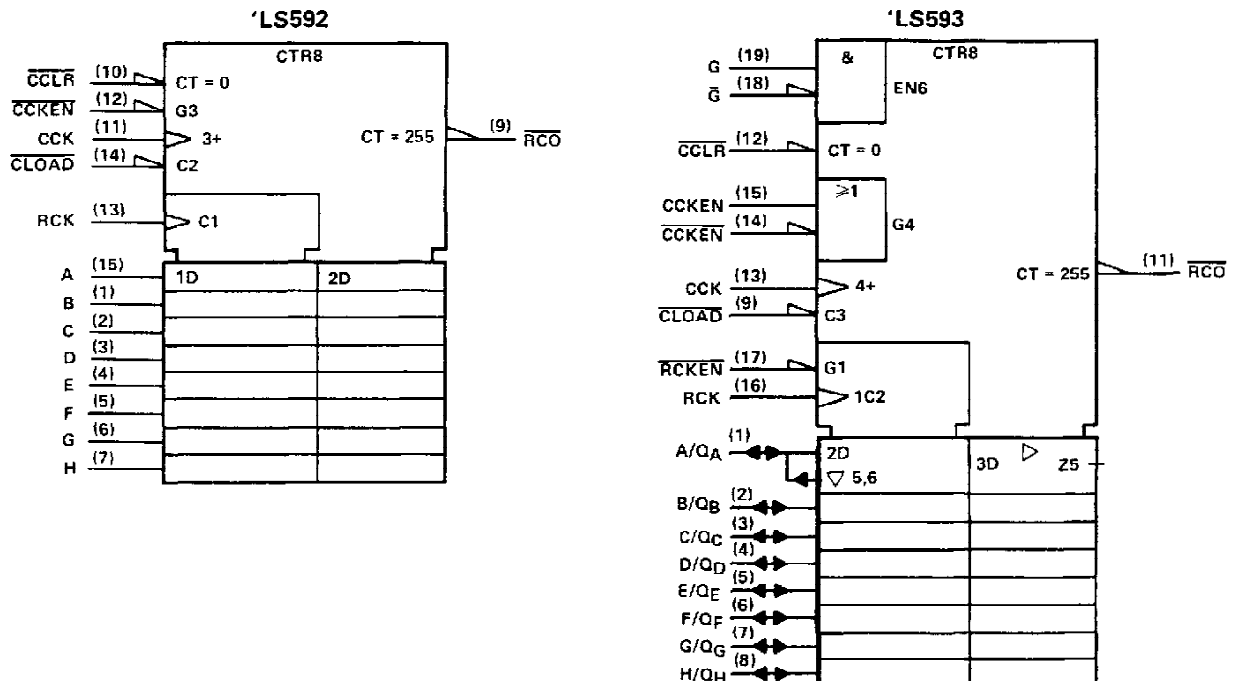
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# **SN54LS592, SN54LS593, SN74LS592, SN74LS593** **8-BIT BINARY COUNTERS WITH INPUT REGISTERS**

## **schematics of inputs and outputs**



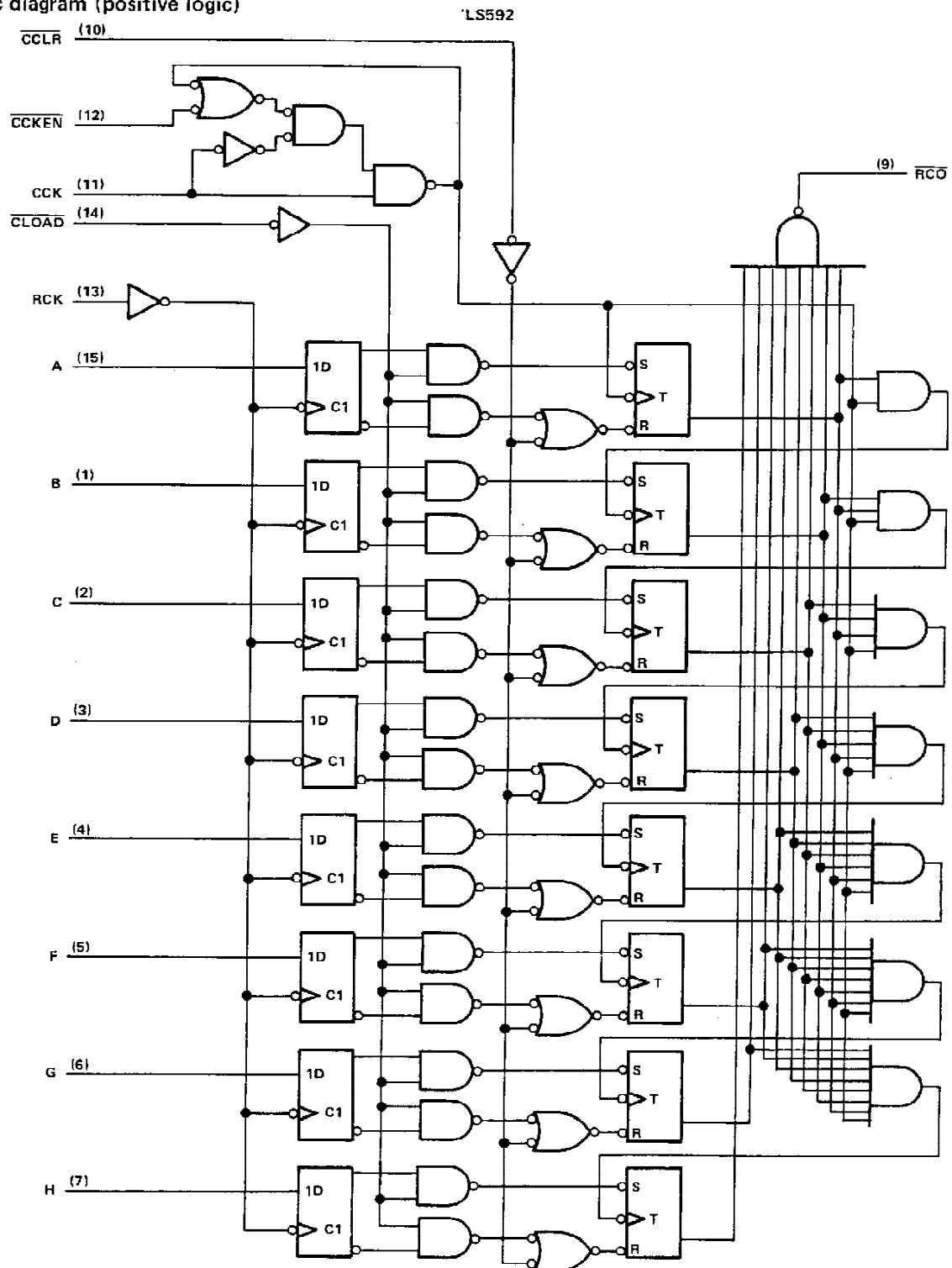
## **logic symbols†**



†These symbols are in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.  
Pin numbers shown are for DW, J, N, and W packages.

# SN54LS592, SN74LS592 8-BIT BINARY COUNTERS WITH INPUT REGISTERS

logic diagram (positive logic)

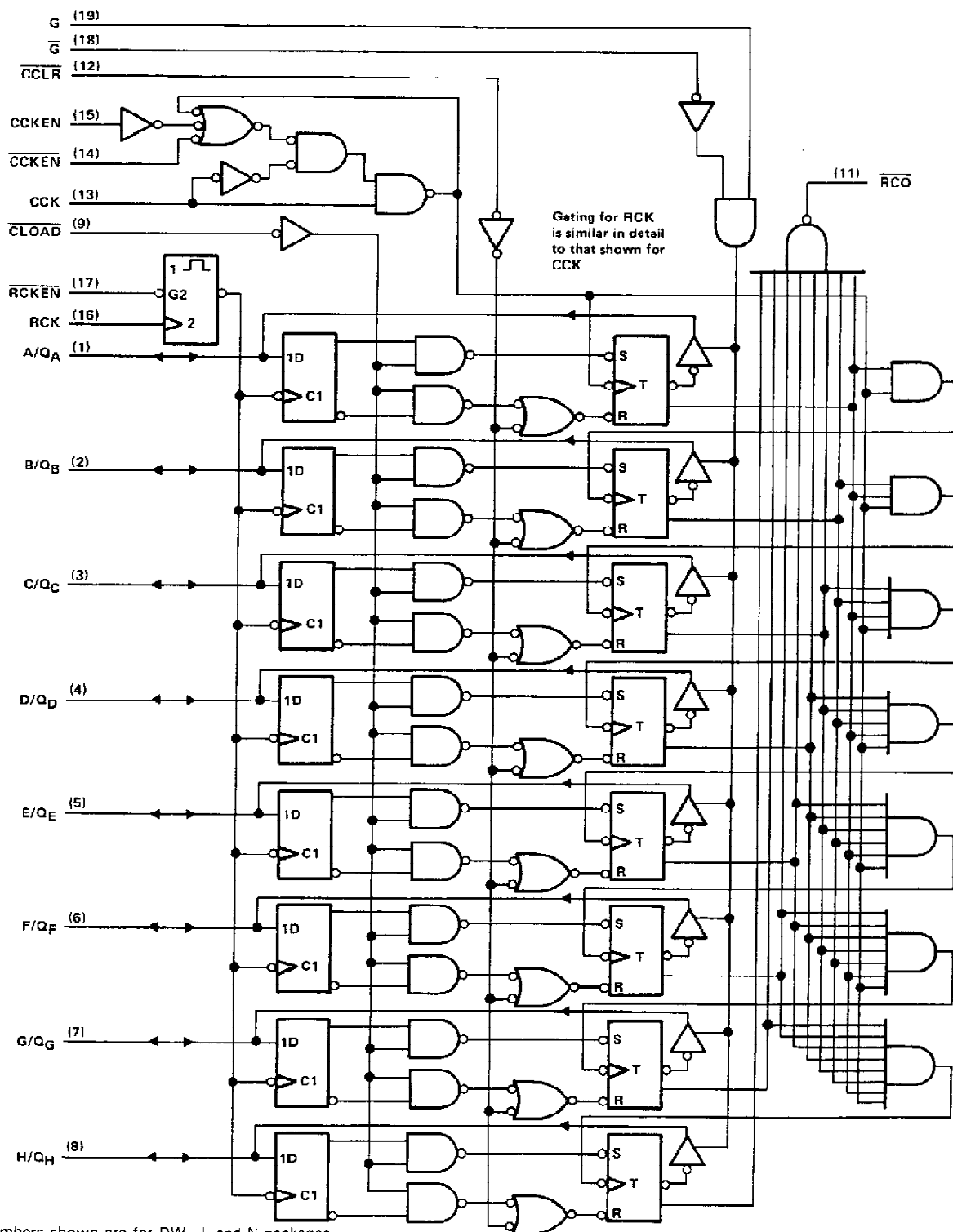


Pin numbers shown are for J, N, and W packages.

# **SN54LS593, SN74LS593** **8-BIT BINARY COUNTERS WITH INPUT REGISTERS**

logic diagram (positive logic)

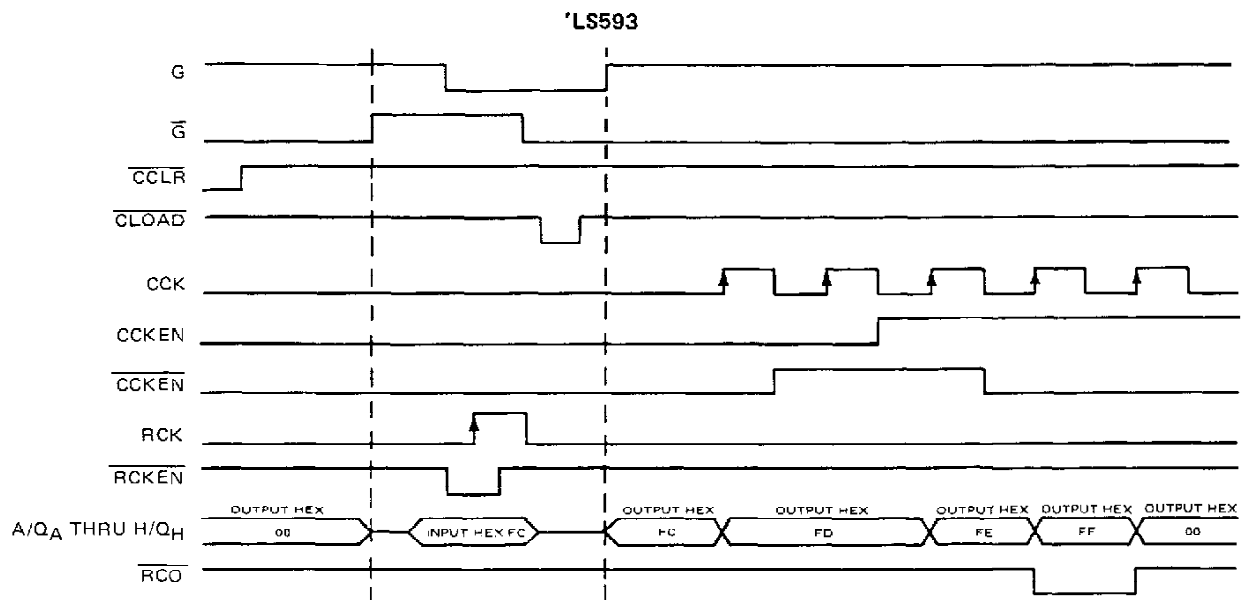
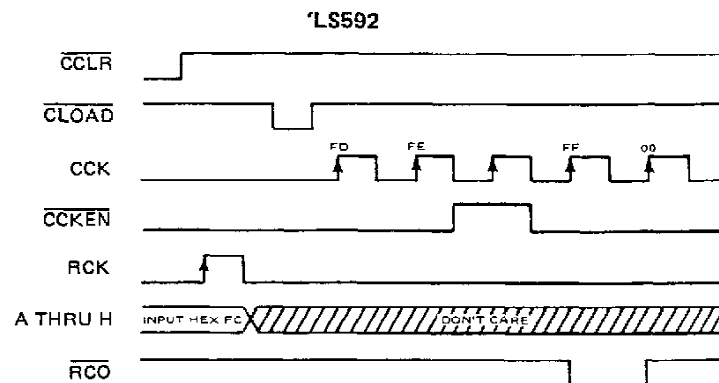
'LS593



Pin numbers shown are for DW, J, and N packages.

**SN54LS592, SN54LS593, SN74LS592, SN74LS593**  
**8-BIT BINARY COUNTERS WITH INPUT REGISTERS**

**typical operating sequences**



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# SN54LS592, SN54LS593, SN74LS592, SN74LS593

## 8-BIT BINARY COUNTERS WITH INPUT REGISTERS

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

|                                                            |                 |
|------------------------------------------------------------|-----------------|
| Supply voltage, $V_{CC}$ (see Note 1)                      | 7 V             |
| Input voltage (excluding I/O ports)                        | 7 V             |
| Off-state output voltage (including I/O ports)             | 5.5 V           |
| Operating free-air temperature range: SN54LS592, SN54LS593 | – 55°C to 125°C |
| SN74LS592, SN74LS593                                       | 0°C to 70°C     |
| Storage temperature range                                  | – 65°C to 150°C |

NOTE 1: Voltage values are with respect to the network ground terminal.

recommended operating conditions

|               |                                                            | SN54LS'                                                                   |     |     | SN74LS' |     |       | UNIT |
|---------------|------------------------------------------------------------|---------------------------------------------------------------------------|-----|-----|---------|-----|-------|------|
|               |                                                            | MIN                                                                       | NOM | MAX | MIN     | NOM | MAX   |      |
| $V_{CC}$      | Supply voltage                                             | 4.5                                                                       | 5   | 5.5 | 4.75    | 5   | 5.25  | V    |
| $V_{IH}$      | High-level input voltage                                   | 2                                                                         |     |     | 2       |     |       | V    |
| $V_{IL}$      | Low-level input voltage                                    |                                                                           |     | 0.7 |         |     | 0.8   | V    |
| $I_{OH}$      | High-level output current                                  | $\overline{RCO}$                                                          |     | – 1 |         |     | – 1   | mA   |
|               |                                                            | Q 'LS593 only                                                             |     | – 1 |         |     | – 2.6 |      |
| $I_{OL}$      | Low-level output current                                   | $\overline{RCO}$                                                          |     | 8   |         |     | 16    | mA   |
|               |                                                            | Q 'LS593 only                                                             |     | 12  |         |     | 24    |      |
| $f_{CLK}$     | Counter clock frequency                                    | 0                                                                         |     | 20  | 0       |     | 20    | MHz  |
| $t_w (CLK)$   | Duration of counter clock pulse                            | 25                                                                        |     |     | 25      |     |       | ns   |
| $t_w (CCLR)$  | Duration of counter clear pulse                            | 20                                                                        |     |     | 20      |     |       | ns   |
| $t_w (RCK)$   | Duration of register clock pulse                           | 20                                                                        |     |     | 20      |     |       | ns   |
| $t_w (CLOAD)$ | Duration of counter load pulse                             | 40                                                                        |     |     | 40      |     |       | ns   |
| $t_{su}$      | Register enable setup time                                 | $\overline{RCKEN}$ low to $\overline{RCK} \uparrow$ , 'LS593              |     | 20  |         |     | 20    | ns   |
| $t_{su}$      | Counter enable setup time before $\overline{CCK} \uparrow$ | $\overline{CCKEN}$ low, 'LS592                                            |     | 30  |         |     | 30    | ns   |
|               |                                                            | $\overline{CCKEN}$ low or                                                 |     |     |         |     |       |      |
|               |                                                            | $\overline{CCKEN}$ high, 'LS593                                           |     | 30  |         |     | 30    |      |
| $t_{su}$      | Setup time                                                 | $\overline{CCLR}$ inactive before $\overline{CCK} \uparrow$               |     | 20  |         |     | 20    | ns   |
|               |                                                            | $\overline{CLOAD}$ inactive before $\overline{CCK} \uparrow$              |     | 20  |         |     | 20    |      |
|               |                                                            | $\overline{RCK} \uparrow$ before $\overline{CLOAD} \uparrow$ (see Note 2) |     | 30  |         |     | 30    |      |
|               |                                                            | Data A thru H before $\overline{RCK} \uparrow$                            |     | 20  |         |     | 20    |      |
| $t_h$         | Hold time                                                  | Data A thru H after $\overline{RCK} \uparrow$                             |     | 0   |         |     | 0     | ns   |
|               |                                                            | All others                                                                |     | 0   |         |     | 0     |      |
| $T_A$         | Operating free-air temperature                             | – 55                                                                      |     | 125 | 0       |     | 70    | °C   |

NOTE 2: This time insures the data saved by  $\overline{RCK} \uparrow$  will also be loaded into the counter.



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# SN54LS592, SN54LS593, SN74LS592, SN74LS593

## 8-BIT BINARY COUNTERS WITH INPUT REGISTERS

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

| PARAMETER         |                           |                                                                                             | TEST CONDITIONS†                               |          | SN54LS*  |          | SN74LS*  |     | UNIT |
|-------------------|---------------------------|---------------------------------------------------------------------------------------------|------------------------------------------------|----------|----------|----------|----------|-----|------|
|                   |                           |                                                                                             |                                                |          | MIN      | TYP‡     | MAX      | MIN |      |
| V <sub>IK</sub>   |                           |                                                                                             | V <sub>CC</sub> = MIN, I <sub>I</sub> = -18 mA |          | -1.5     |          | -1.5     |     | V    |
| V <sub>OH</sub>   | 'LS593 Q                  | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = MAX                         | I <sub>OH</sub> = -1 mA                        |          | 2.4      | 3.2      |          |     | V    |
|                   | I <sub>OH</sub> = -2.6 mA |                                                                                             |                                                |          | 2.4      | 3.1      |          |     |      |
|                   | RCO                       | I <sub>OH</sub> = -1 mA                                                                     |                                                | 2.4      | 3.2      | 2.4 3.2  |          |     |      |
| V <sub>OL</sub>   | 'LS593 Q                  | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = MAX                         | I <sub>OL</sub> = 12 mA                        |          | 0.25 0.4 |          | 0.25 0.4 |     | V    |
|                   | I <sub>OL</sub> = 24 mA   |                                                                                             |                                                |          | 0.35 0.5 |          |          |     |      |
|                   | I <sub>OL</sub> = 8 mA    |                                                                                             | 0.25 0.4                                       |          | 0.25 0.4 |          |          |     |      |
|                   | I <sub>OL</sub> = 16 mA   |                                                                                             |                                                |          | 0.35 0.5 |          |          |     |      |
| I <sub>OZH</sub>  | 'LS593 Q                  | V <sub>CC</sub> = MAX, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = MAX, V <sub>O</sub> = 2.7 V |                                                | 20       |          | 20       |          | μA  |      |
| I <sub>OZL</sub>  | 'LS593 Q                  | V <sub>CC</sub> = MAX, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = MAX, V <sub>O</sub> = 0.4 V |                                                | -0.4     |          | -0.4     |          | mA  |      |
| I <sub>I</sub>    | 'LS593 Q                  | V <sub>CC</sub> = MAX                                                                       | V <sub>I</sub> = 5.5 V                         |          | 0.1      |          | 0.1      |     | mA   |
|                   | Others                    |                                                                                             | V <sub>I</sub> = 7 V                           |          | 0.1      |          |          |     |      |
| I <sub>IH</sub>   |                           |                                                                                             | V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V  |          | 20       |          | 20       |     | μA   |
| I <sub>IL</sub>   | CCK                       |                                                                                             | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V  |          | -0.8     |          | -0.8     |     | mA   |
|                   | RCK                       | 'LS592                                                                                      |                                                |          | -0.2     |          | -0.2     |     |      |
|                   |                           | 'LS593                                                                                      |                                                |          | -0.8     |          | -0.8     |     |      |
|                   | A thru H                  |                                                                                             |                                                |          | -0.4     |          | -0.4     |     |      |
|                   | Others                    |                                                                                             |                                                |          | -0.2     |          | -0.2     |     |      |
| I <sub>OS</sub> § | 'LS593 Q                  | V <sub>CC</sub> = MAX, V <sub>O</sub> = 0 V                                                 |                                                | -30 -130 |          | -30 -130 |          | mA  |      |
|                   | RCO                       |                                                                                             |                                                | -20 -100 |          |          |          |     |      |
| I <sub>CC</sub>   | 'LS592                    | I <sub>CCH</sub>                                                                            | 40 60                                          |          | 40 60    |          | mA       |     |      |
|                   |                           | I <sub>CCL</sub>                                                                            | 40 60                                          |          | 40 60    |          |          |     |      |
|                   | 'LS593                    | I <sub>CCH</sub>                                                                            | 47 70                                          |          | 47 70    |          |          |     |      |
|                   |                           | I <sub>CCL</sub>                                                                            | 53 80                                          |          | 53 80    |          |          |     |      |
|                   |                           | I <sub>CCZ</sub>                                                                            | 57 85                                          |          | 57 85    |          |          |     |      |

†For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡All typical values are at  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

§Not more than one output should be shorted at a time and the duration of the short-circuit should not exceed one second.

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**SN54LS592, SN54LS593, SN74LS592, SN74LS593**  
**8-BIT BINARY COUNTERS WITH INPUT REGISTERS**

switching characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ , (see note 3)

| PARAMETER        | FROM<br>(INPUT)                      | TO<br>(OUTPUT)          | TEST CONDITIONS                                 | 'LS592 |     |     | 'LS593 |     |     | UNIT |
|------------------|--------------------------------------|-------------------------|-------------------------------------------------|--------|-----|-----|--------|-----|-----|------|
|                  |                                      |                         |                                                 | MIN    | TYP | MAX | MIN    | TYP | MAX |      |
| $f_{\max}$       | CCK                                  | $\overline{\text{RCO}}$ | $R_L = 1\text{ k}\Omega$ , $C_L = 30\text{ pF}$ | 20     | 35  |     | 20     | 35  |     | MHz  |
| $t_{\text{PLH}}$ | CCK $\uparrow$                       | Q                       | $R_L = 667\ \Omega$ , $C_L = 45\text{ pF}$      |        |     |     | 14     | 21  |     | ns   |
| $t_{\text{PHL}}$ | CCK $\uparrow$                       | Q                       |                                                 |        |     |     | 26     | 39  |     | ns   |
| $t_{\text{PLH}}$ | $\overline{\text{CLOAD}} \downarrow$ | Q                       |                                                 |        |     |     | 34     | 51  |     | ns   |
| $t_{\text{PHL}}$ | $\overline{\text{CLOAD}} \downarrow$ | Q                       |                                                 |        |     |     | 28     | 42  |     | ns   |
| $t_{\text{PHL}}$ | $\overline{\text{CCLR}} \downarrow$  | Q                       |                                                 |        |     |     | 25     | 38  |     | ns   |
| $t_{\text{PZH}}$ | G $\uparrow$                         | Q                       |                                                 |        |     |     | 31     | 47  |     | ns   |
| $t_{\text{PZL}}$ | G $\uparrow$                         | Q                       |                                                 |        |     |     | 27     | 40  |     | ns   |
| $t_{\text{PZH}}$ | $\overline{\text{G}} \downarrow$     | Q                       |                                                 |        |     |     | 29     | 45  |     | ns   |
| $t_{\text{PZL}}$ | $\overline{\text{G}} \downarrow$     | Q                       |                                                 |        |     |     | 31     | 47  |     | ns   |
| $t_{\text{PHZ}}$ | G $\downarrow$                       | Q                       |                                                 |        |     |     | 33     | 50  |     | ns   |
| $t_{\text{PLZ}}$ | G $\downarrow$                       | Q                       | $R_L = 667\ \Omega$ , $C_L = 5\text{ pF}$       |        |     |     | 35     | 52  |     | ns   |
| $t_{\text{PHZ}}$ | $\overline{\text{G}} \uparrow$       | Q                       |                                                 |        |     |     | 26     | 39  |     | ns   |
| $t_{\text{PLZ}}$ | $\overline{\text{G}} \uparrow$       | Q                       |                                                 |        |     |     | 28     | 42  |     | ns   |
| $t_{\text{PLH}}$ | CCK $\uparrow$                       | $\overline{\text{RCO}}$ | $R_L = 1\text{ k}\Omega$ , $C_L = 30\text{ pF}$ | 15     | 23  |     | 14     | 21  |     | ns   |
| $t_{\text{PHL}}$ | CCK $\uparrow$                       | $\overline{\text{RCO}}$ |                                                 | 20     | 30  |     | 20     | 30  |     | ns   |
| $t_{\text{PLH}}$ | $\overline{\text{CLOAD}} \downarrow$ | $\overline{\text{RCO}}$ |                                                 | 31     | 47  |     | 31     | 47  |     | ns   |
| $t_{\text{PHL}}$ | $\overline{\text{CLOAD}} \downarrow$ | $\overline{\text{RCO}}$ |                                                 | 27     | 41  |     | 27     | 41  |     | ns   |
| $t_{\text{PLH}}$ | $\overline{\text{CCLR}} \downarrow$  | $\overline{\text{RCO}}$ |                                                 | 30     | 45  |     | 30     | 45  |     | ns   |
| $t_{\text{PLH}}$ | RCK $\uparrow$                       | $\overline{\text{RCO}}$ | $R_L = 1\text{ k}\Omega$ ; $C_L = 30\text{ pF}$ | 35     | 53  |     | 42     | 63  |     | ns   |
| $t_{\text{PHL}}$ | RCK $\uparrow$                       | $\overline{\text{RCO}}$ | $\overline{\text{CLOAD}} = L$                   | 30     | 45  |     | 33     | 50  |     | ns   |

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

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**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> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| 5962-87621012A   | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| 5962-8762101EA   | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| 5962-8762101EA   | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| 5962-8762101FA   | ACTIVE                | CFP          | W               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| 5962-8762101FA   | ACTIVE                | CFP          | W               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SN54LS592J       | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SN54LS592J       | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SN54LS593J       | ACTIVE                | CDIP         | J               | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SN54LS593J       | ACTIVE                | CDIP         | J               | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SN74LS592D       | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1YEAR           |
| SN74LS592D       | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1YEAR           |
| SN74LS592DE4     | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1YEAR           |
| SN74LS592DE4     | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1YEAR           |
| SN74LS592DR      | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1YEAR           |
| SN74LS592DR      | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1YEAR           |
| SN74LS592DRE4    | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1YEAR           |
| SN74LS592DRE4    | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1YEAR           |
| SN74LS592N       | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| SN74LS592N       | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| SN74LS592N3      | OBSOLETE              | PDIP         | N               | 16   |             | TBD                     | Call TI          | Call TI                      |
| SN74LS592N3      | OBSOLETE              | PDIP         | N               | 16   |             | TBD                     | Call TI          | Call TI                      |
| SN74LS592NE4     | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| SN74LS592NE4     | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| SN74LS592NSR     | ACTIVE                | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS592NSR     | ACTIVE                | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS592NSRE4   | ACTIVE                | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS592NSRE4   | ACTIVE                | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS593DW      | ACTIVE                | SOIC         | DW              | 20   | 25          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS593DW      | ACTIVE                | SOIC         | DW              | 20   | 25          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SN74LS593DWE4    | ACTIVE                | SOIC         | DW              | 20   | 25          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS593DWE4    | ACTIVE                | SOIC         | DW              | 20   | 25          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS593DWR     | ACTIVE                | SOIC         | DW              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS593DWR     | ACTIVE                | SOIC         | DW              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS593DWRE4   | ACTIVE                | SOIC         | DW              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS593DWRE4   | ACTIVE                | SOIC         | DW              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS593N       | ACTIVE                | PDIP         | N               | 20   | 20          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| SN74LS593N       | ACTIVE                | PDIP         | N               | 20   | 20          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| SN74LS593N3      | OBSOLETE              | PDIP         | N               | 20   |             | TBD                     | Call TI          | Call TI                      |
| SN74LS593N3      | OBSOLETE              | PDIP         | N               | 20   |             | TBD                     | Call TI          | Call TI                      |
| SN74LS593NE4     | ACTIVE                | PDIP         | N               | 20   | 20          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| SN74LS593NE4     | ACTIVE                | PDIP         | N               | 20   | 20          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC               |
| SN74LS593NSR     | ACTIVE                | SO           | NS              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS593NSR     | ACTIVE                | SO           | NS              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS593NSRE4   | ACTIVE                | SO           | NS              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS593NSRE4   | ACTIVE                | SO           | NS              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SNJ54LS592FK     | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SNJ54LS592FK     | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SNJ54LS592J      | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SNJ54LS592J      | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SNJ54LS592W      | ACTIVE                | CFP          | W               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SNJ54LS592W      | ACTIVE                | CFP          | W               | 16   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SNJ54LS593FK     | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SNJ54LS593FK     | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SNJ54LS593J      | ACTIVE                | CDIP         | J               | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SNJ54LS593J      | ACTIVE                | CDIP         | J               | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC               |
| SNJ54LS593W      | OBSOLETE              |              |                 | 20   |             | TBD                     | Call TI          | Call TI                      |
| SNJ54LS593W      | OBSOLETE              |              |                 | 20   |             | TBD                     | Call TI          | Call TI                      |

<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.

(2) 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)

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

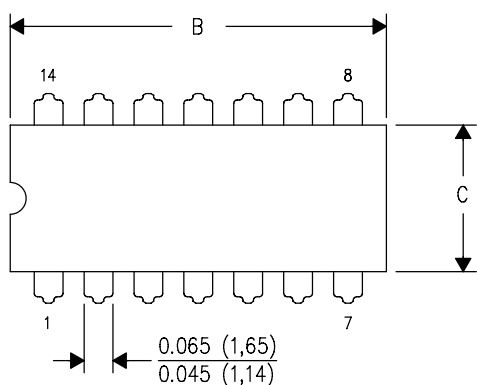
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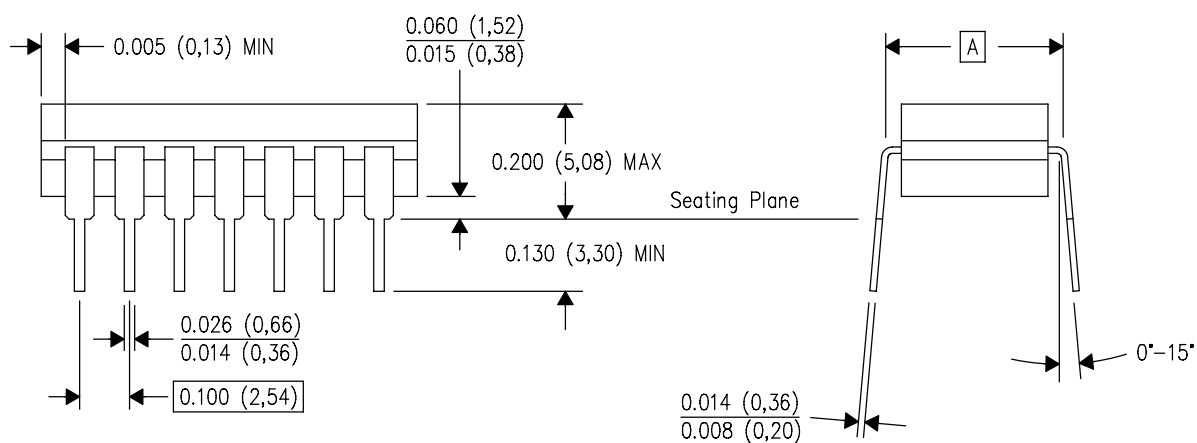
J (R-GDIP-T\*\*)

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)        |

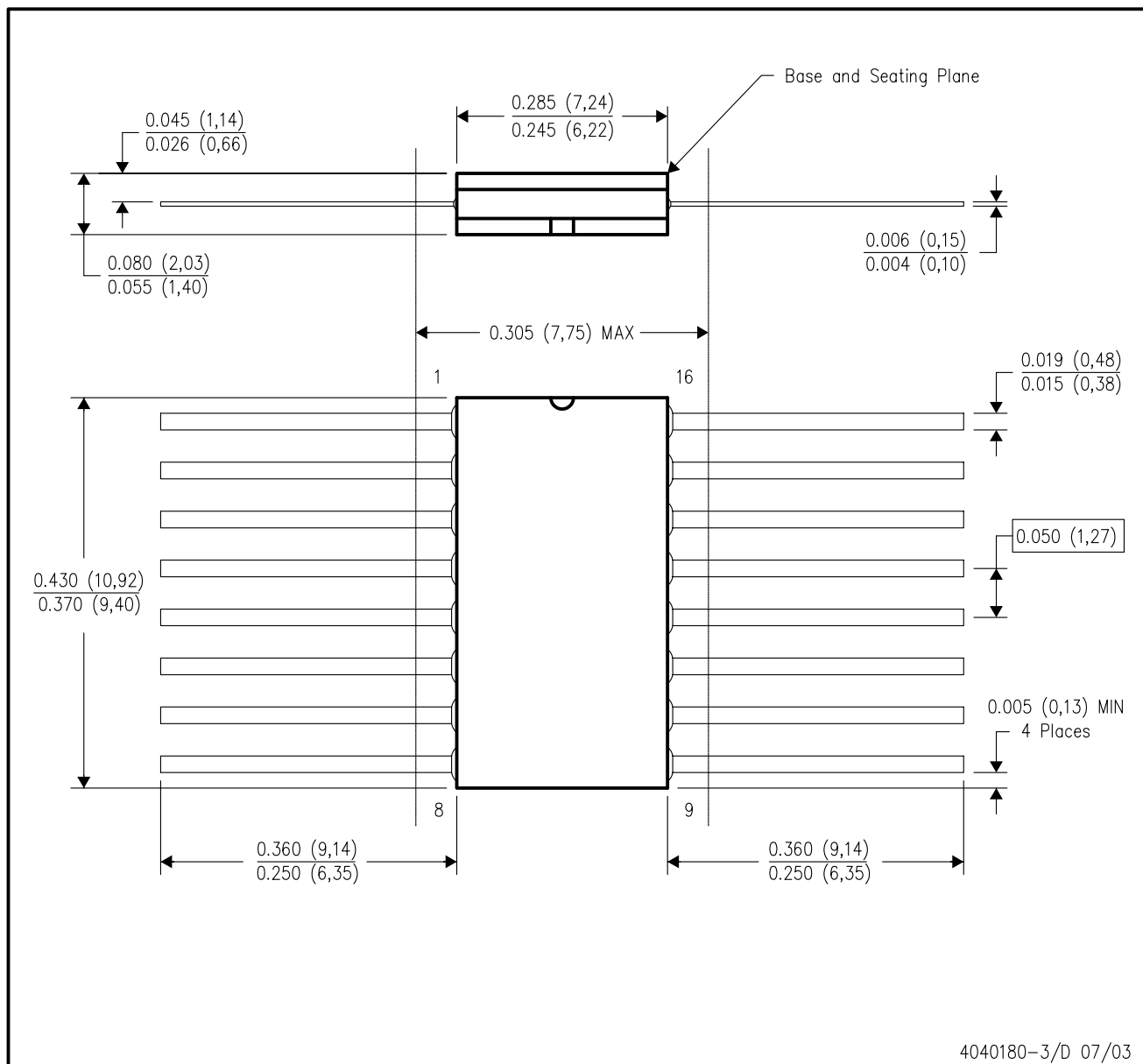


4040083/F 03/03

- 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.

W (R-GDFP-F16)

CERAMIC DUAL FLATPACK

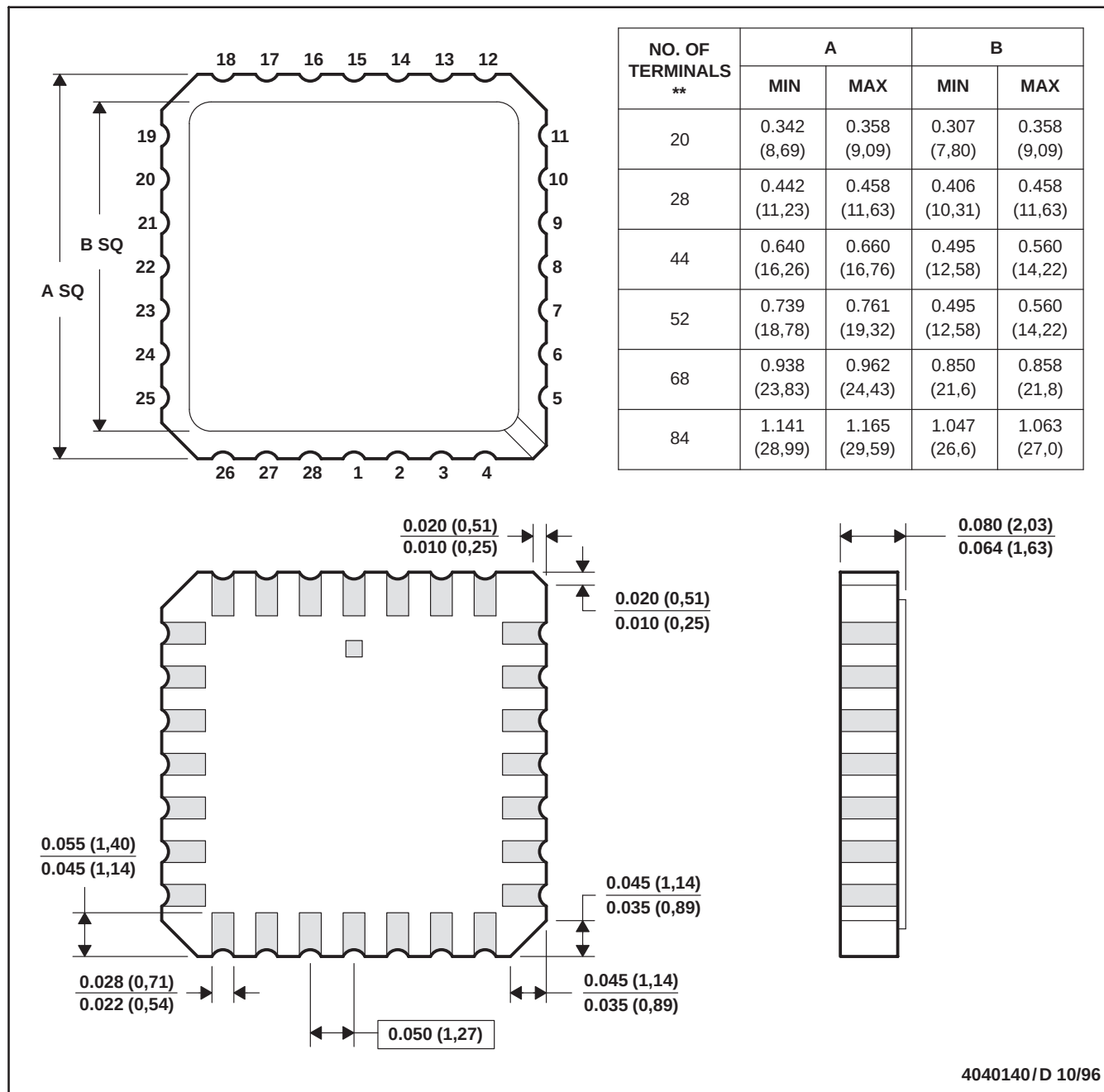


- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a ceramic lid using glass frit.
  - Index point is provided on cap for terminal identification only.
  - Falls within MIL STD 1835 GDFP1-F16 and JEDEC MO-092AC

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

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN

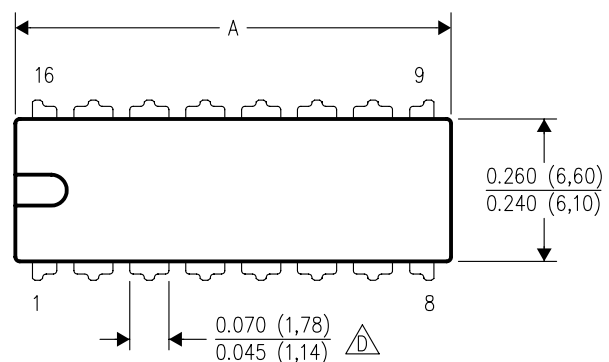


- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a metal lid.
  - The terminals are gold plated.
  - Falls within JEDEC MS-004

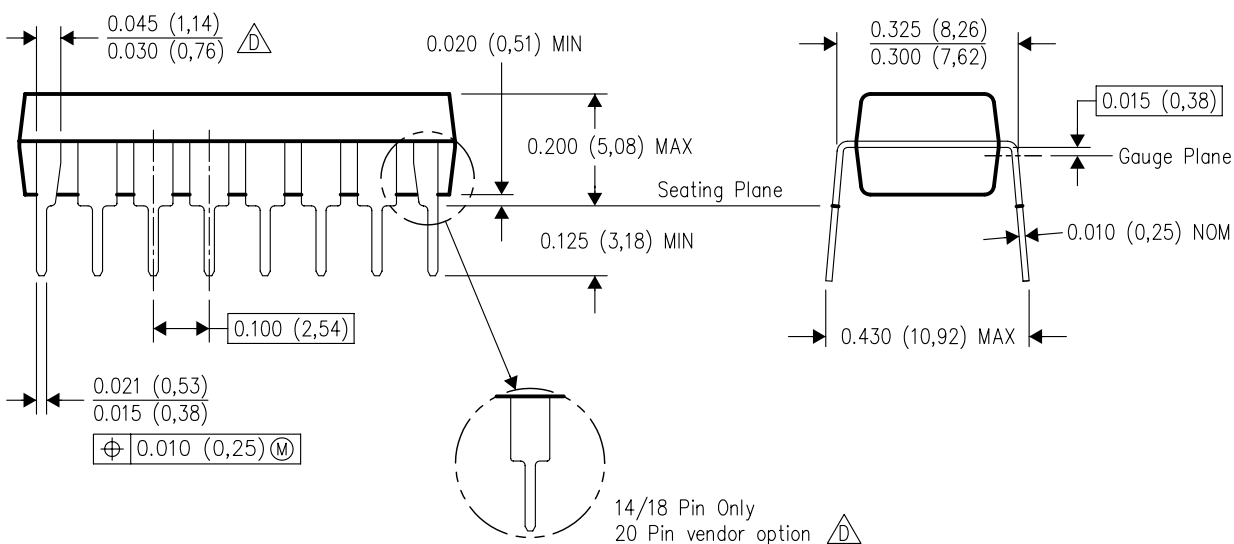
N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



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



4040049/E 12/2002

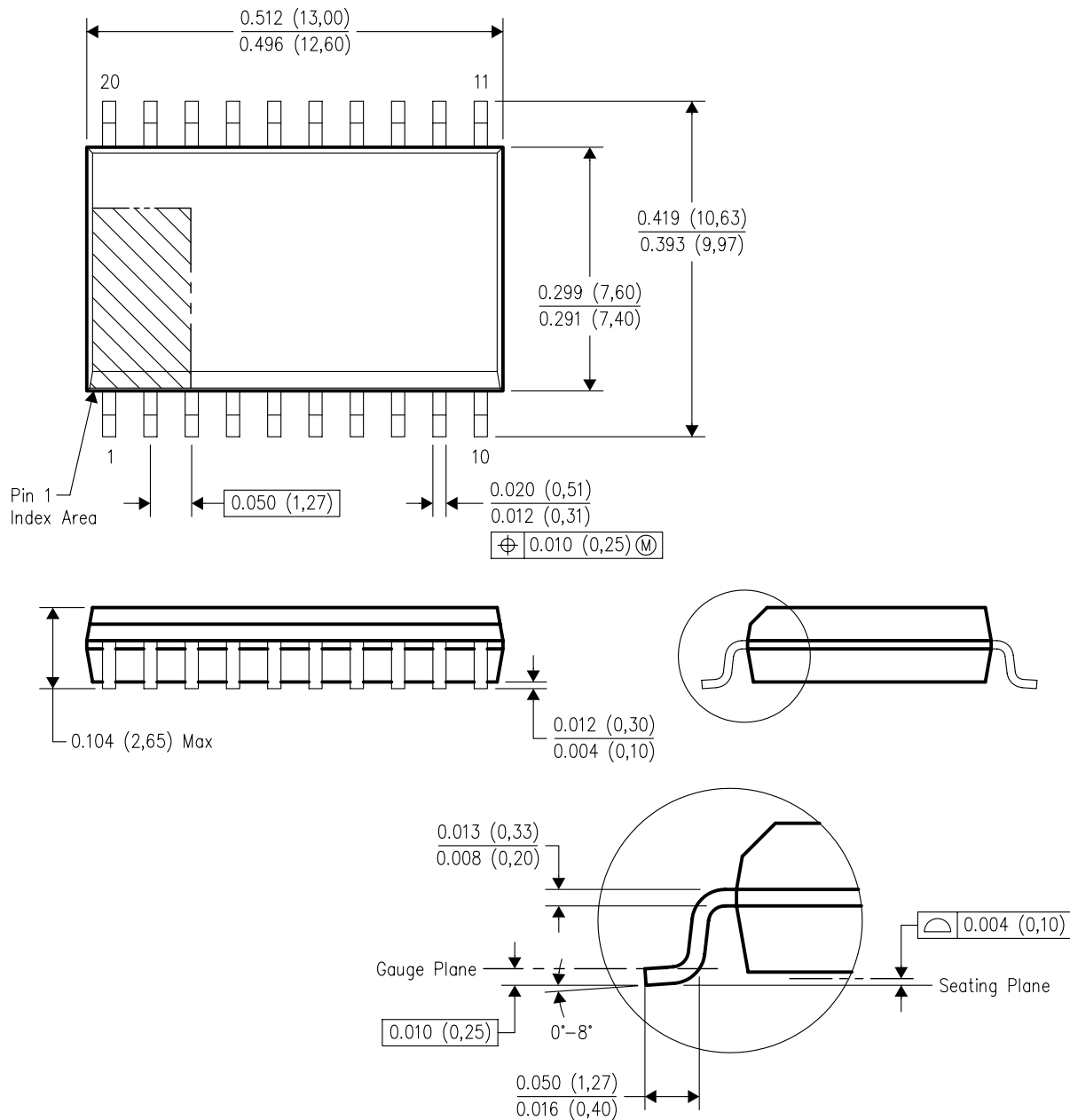
NOTES:

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



## DW (R-PDSO-G20)

## PLASTIC SMALL-OUTLINE PACKAGE

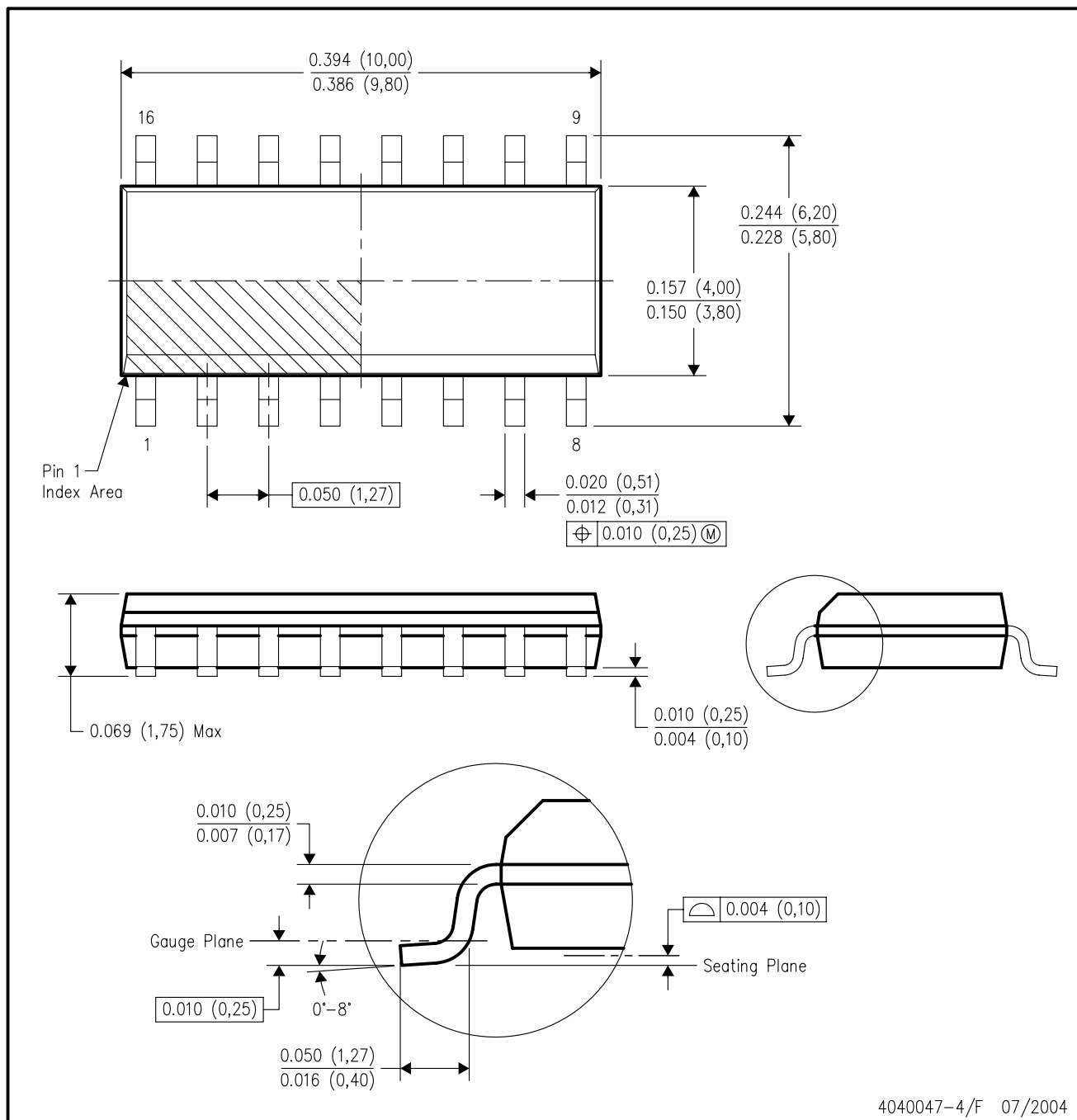


4040000-4/F 06/2004

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - D. Falls within JEDEC MS-013 variation AC.

## D (R-PDSO-G16)

## PLASTIC SMALL-OUTLINE PACKAGE



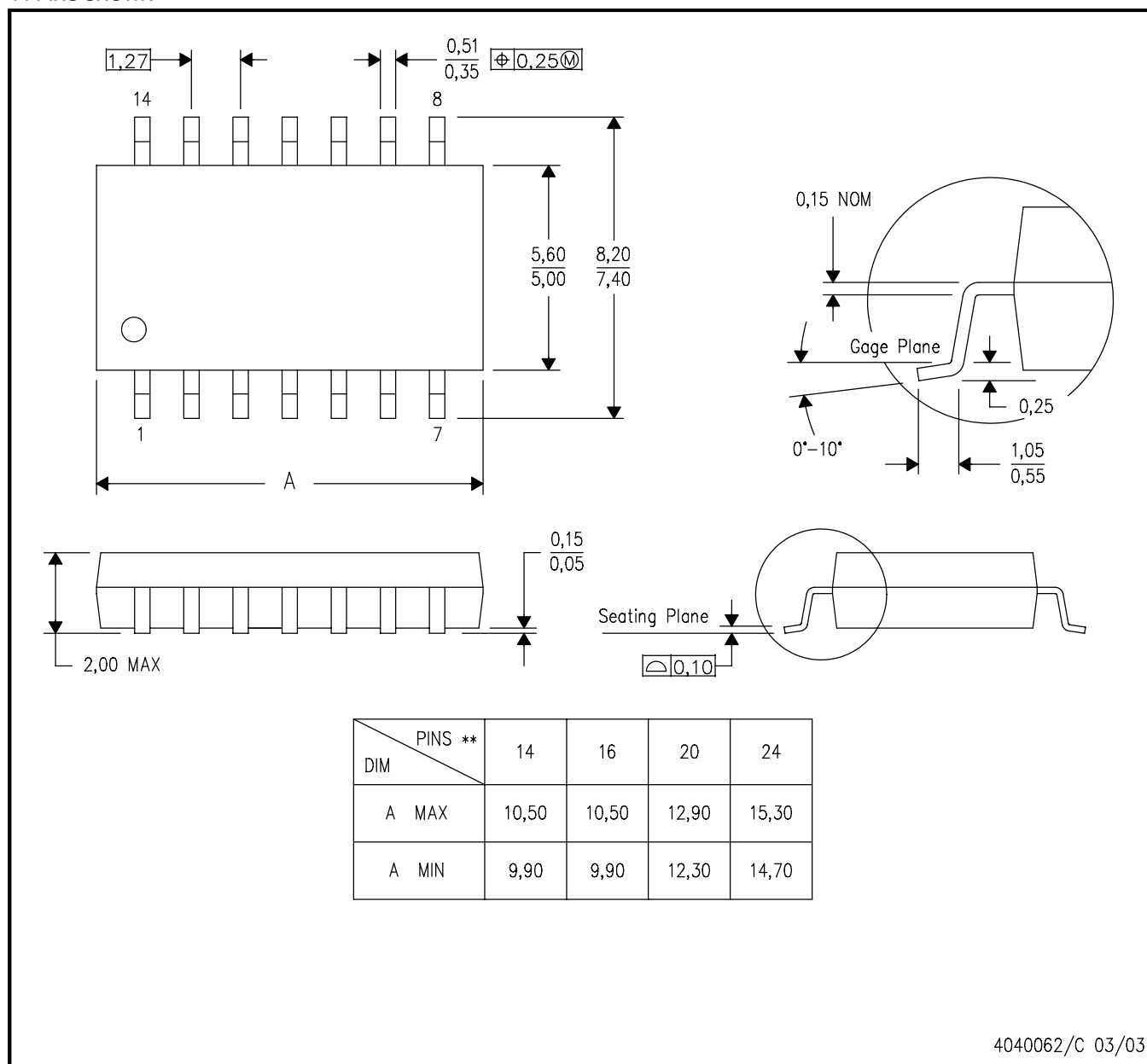
- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - Falls within JEDEC MS-012 variation AC.

# MECHANICAL DATA

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

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



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

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Mailing Address: Texas Instruments  
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