

# 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.

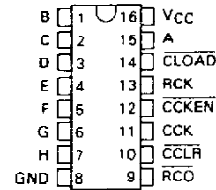
### OUTPUT ENABLE CONTROL ('593 ONLY)

| 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                             |

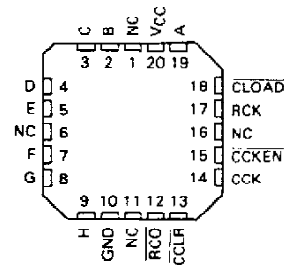
### COUNTER CLOCK ENABLE CONTROL

| 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)

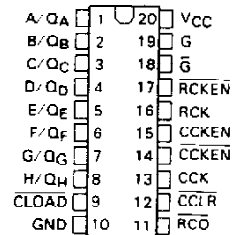


### SN54LS592 . . . FK PACKAGE (TOP VIEW)

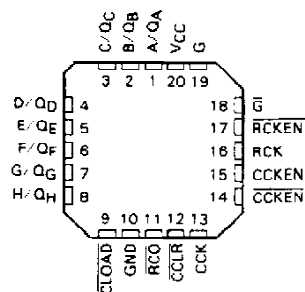


NC — No internal connection

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



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



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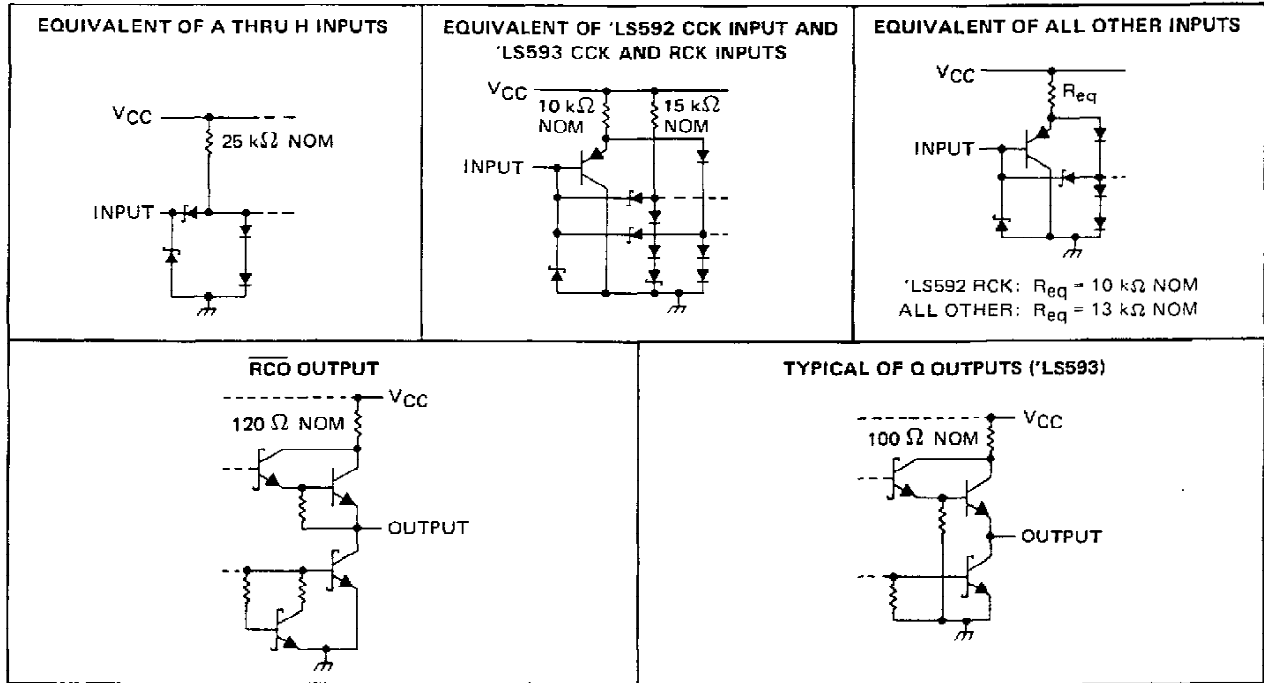
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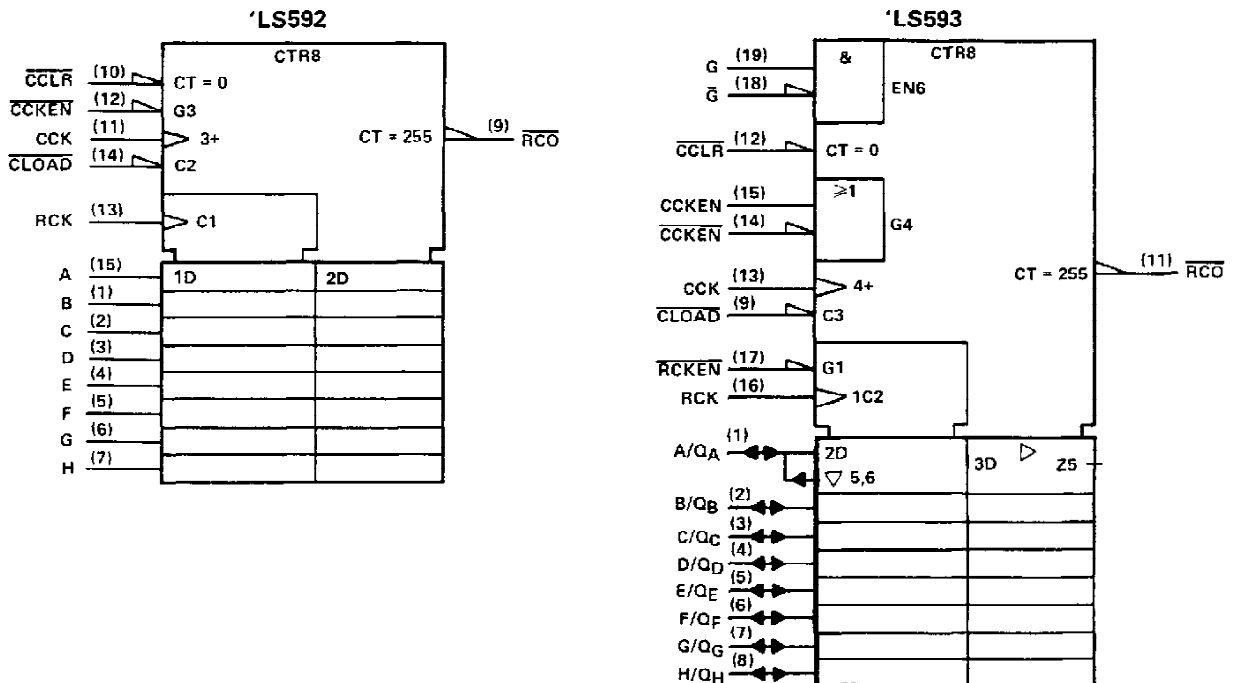
SN54LS592, SN54LS593, SN74LS592, SN74LS593  
 8 BIT BINARY COUNTERS WITH INPUT REGISTERS

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schematics of inputs and outputs



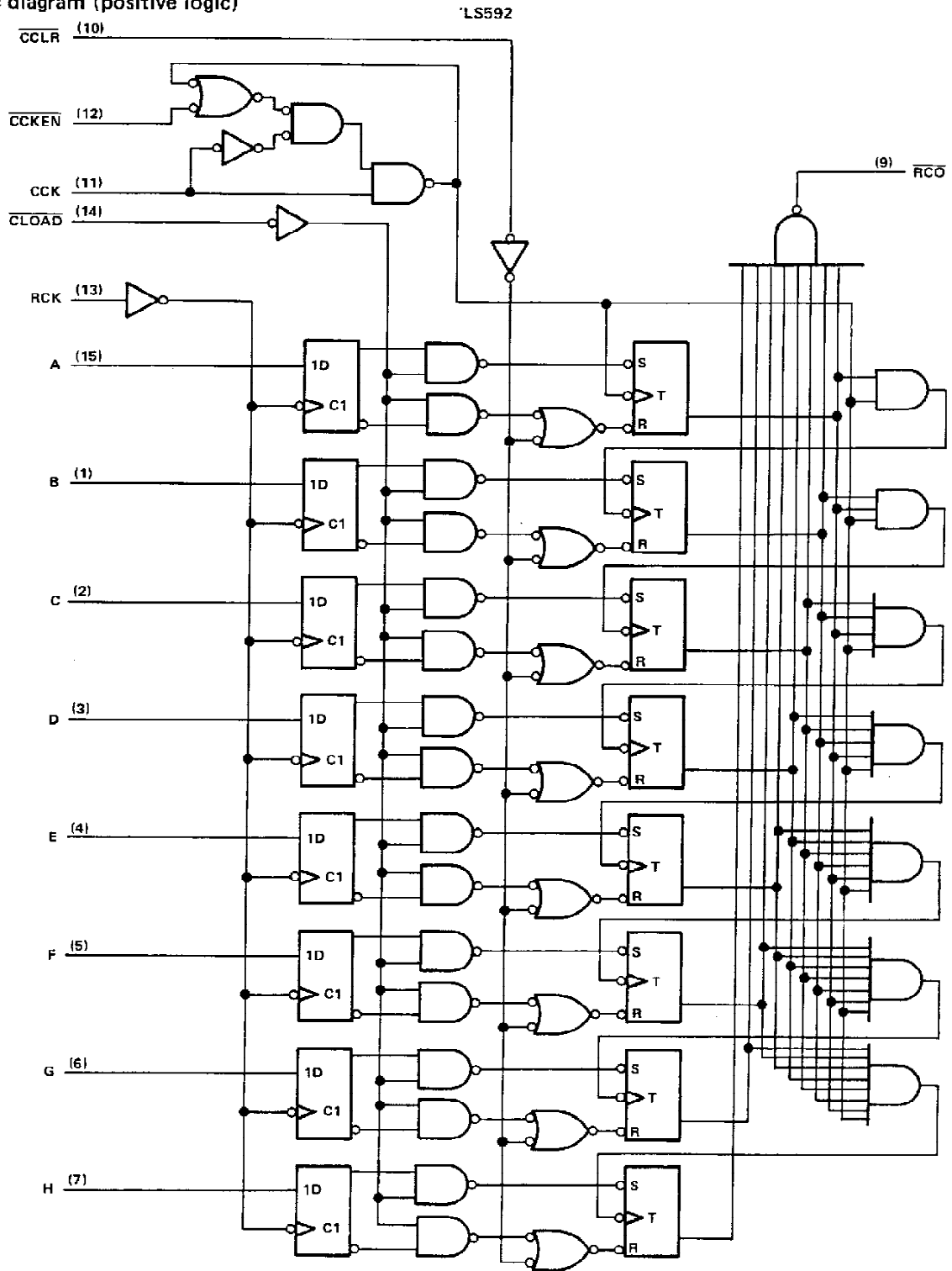
logic symbols †



† 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.



logic diagram (positive logic)

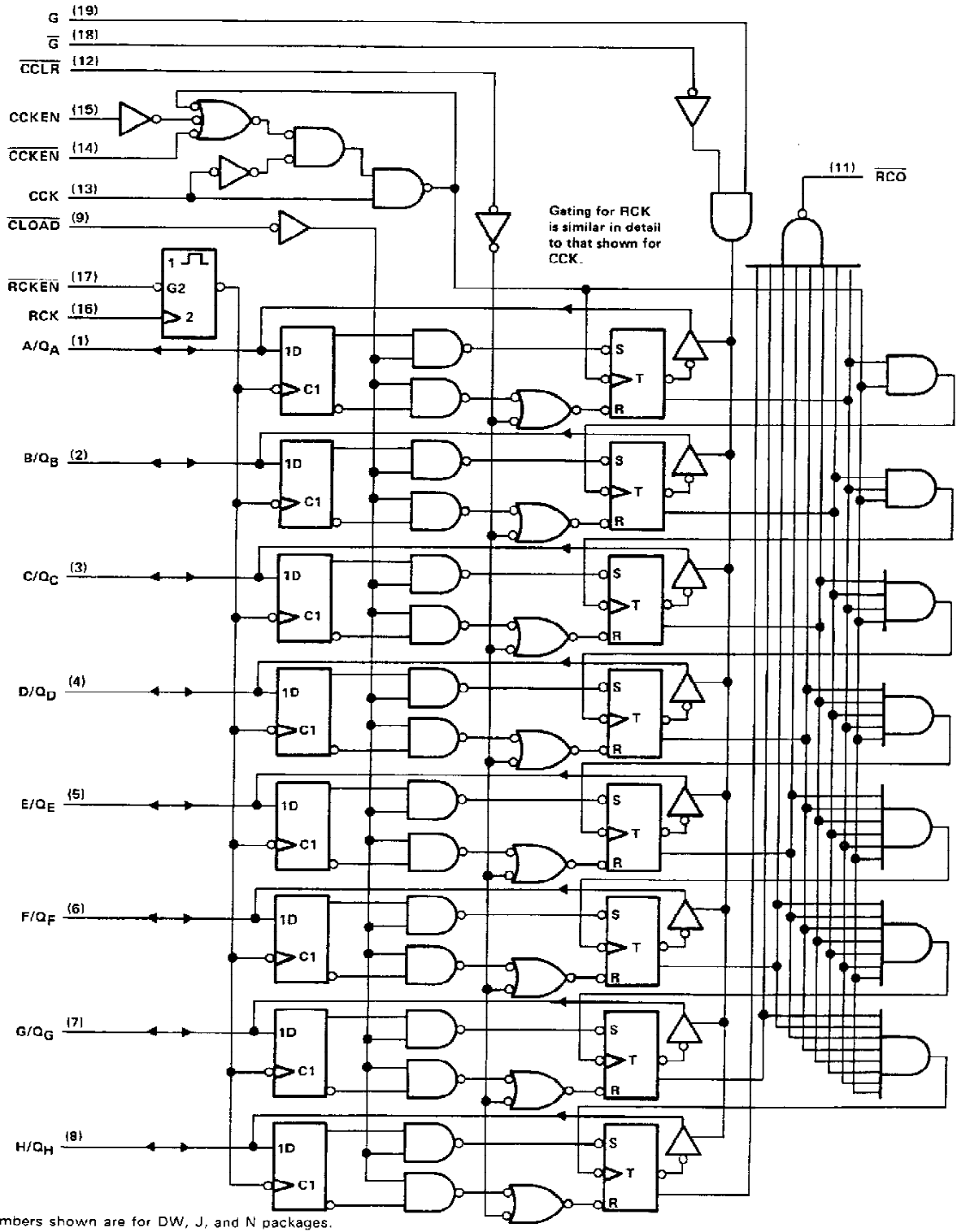


Pin numbers shown are for J, N, and W packages.

SN54LS593, SN74LS593  
8-BIT BINARY COUNTERS WITH INPUT REGISTERS

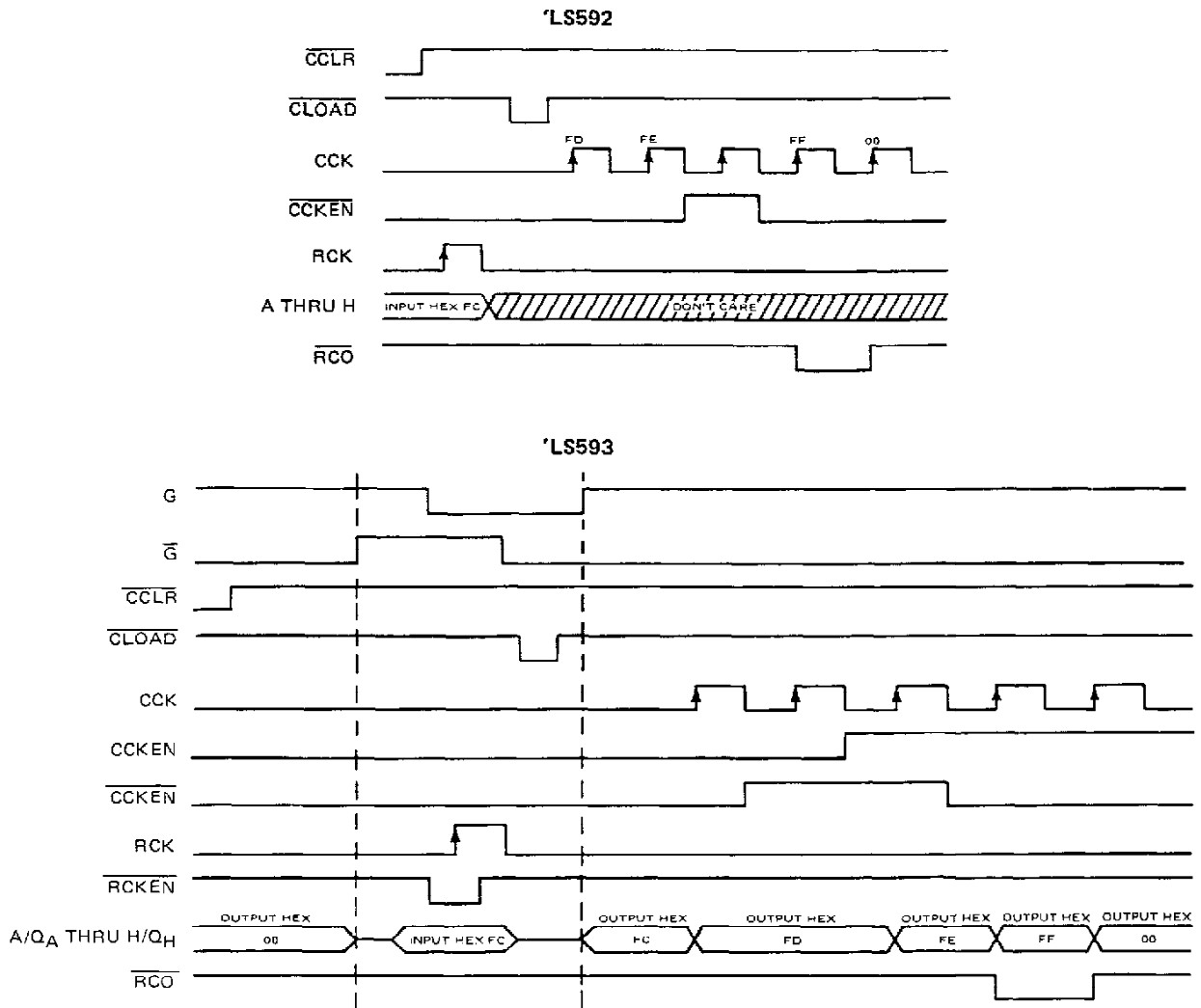
Logic diagram (positive logic)

'LS593



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

typical operating sequences



**SN54LS592, SN54LS593, SN74LS592, SN74LS593**  
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**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                       | $\overline{RCK}$   |     | -1  | $\overline{RCK}$   |     | -1   | mA   |
|               |   | Q 'LS593 only  |     | -1  | Q 'LS593 only  |     | -2.6 |      |
| $I_{OL}$      | Low-level output current                        | $\overline{RCK}$   |     | 8   | $\overline{RCK}$   |     | 16   | mA   |
|               |   | Q 'LS593 only  |     | 12  | Q 'LS593 only  |     | 24   |      |
| $f_{CCK}$     | Counter clock frequency                         | 0  |     | 20  | 0  |     | 20   | MHz  |
| $t_w$ (CCK)   | 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 RCK $\uparrow$ , 'LS593                |     | 20  | $\overline{RCKEN}$ low to RCK $\uparrow$ , 'LS593                |     | 20   | ns   |
| $t_{su}$      | Counter enable setup time before CCK $\uparrow$ | $\overline{CCKEN}$ low, 'LS592                                   |     | 30  | $\overline{CCKEN}$ low, 'LS592                                   |     | 30   | ns   |
|               |   | $\overline{CCKEN}$ low or $\overline{CCKEN}$ high, 'LS593        |     | 30  | $\overline{CCKEN}$ low or $\overline{CCKEN}$ high, 'LS593        |     | 30   |      |
| $t_{su}$      | Setup time                                      | $\overline{CCLR}$ inactive before CCK $\uparrow$                 |     | 20  | $\overline{CCLR}$ inactive before CCK $\uparrow$                 |     | 20   | ns   |
|               |   | $\overline{CLOAD}$ inactive before CCK $\uparrow$                |     | 20  | $\overline{CLOAD}$ inactive before CCK $\uparrow$                |     | 20   |      |
|               |   | RCK $\uparrow$ before $\overline{CLOAD}$ $\uparrow$ (see Note 2) |     | 30  | RCK $\uparrow$ before $\overline{CLOAD}$ $\uparrow$ (see Note 2) |     | 30   |      |
|               |   | Data A thru H before RCK $\uparrow$                              |     | 20  | Data A thru H before RCK $\uparrow$                              |     | 20   |      |
| $t_h$         | Hold time                                       | Data A thru H after RCK $\uparrow$                               |     | 0   | Data A thru H after RCK $\uparrow$                               |     | 0    | ns   |
|               |   | All others   |     | 0   | All others   |     | 0    |      |
| $T_A$         | Operating free-air temperature                  | -55  |     | 125 | 0  |     | 70   | °C   |

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



**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     | TYP‡ | MAX  |      |      |
| V <sub>IK</sub>   | V <sub>CC</sub> = MIN, I <sub>I</sub> = -18 mA  |                           |                  | -1.5 |         |      | -1.5 | V    |      |
| V <sub>OH</sub>   | 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  |      |      |
|                   |   | I <sub>OH</sub> = -1 mA   |                  | 2.4  | 3.2     | 2.4  | 3.2  |      |      |
| V <sub>OL</sub>   | 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>  | 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>  | 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>    | V <sub>CC</sub> = MAX   | V <sub>I</sub> = 5.5 V    |                  |      |         | 0.1  | 0.1  | mA   |      |
|                   |   | V <sub>I</sub> = 7 V      |                  |      |         | 0.1  | 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>   | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V   | CCK                       |                  |      |         | -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> § | V <sub>CC</sub> = MAX, V <sub>O</sub> = 0 V   | 'LS593 Q                  |                  | -30  | -130    | -30  | -130 | mA   |      |
|                   |   | RCO                       |                  | -20  | -100    | -20  | -100 |      |      |
| I <sub>CC</sub>   | V <sub>CC</sub> = MAX, All possible inputs grounded, All outputs open                       | '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<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°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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switching characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ , (see note 3)

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

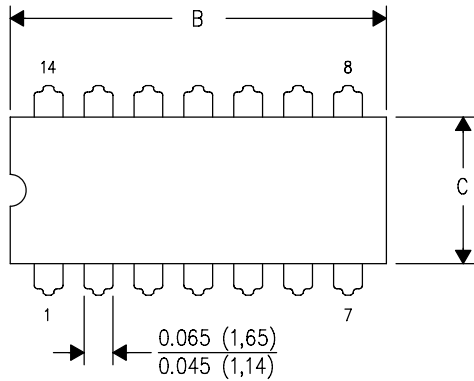
(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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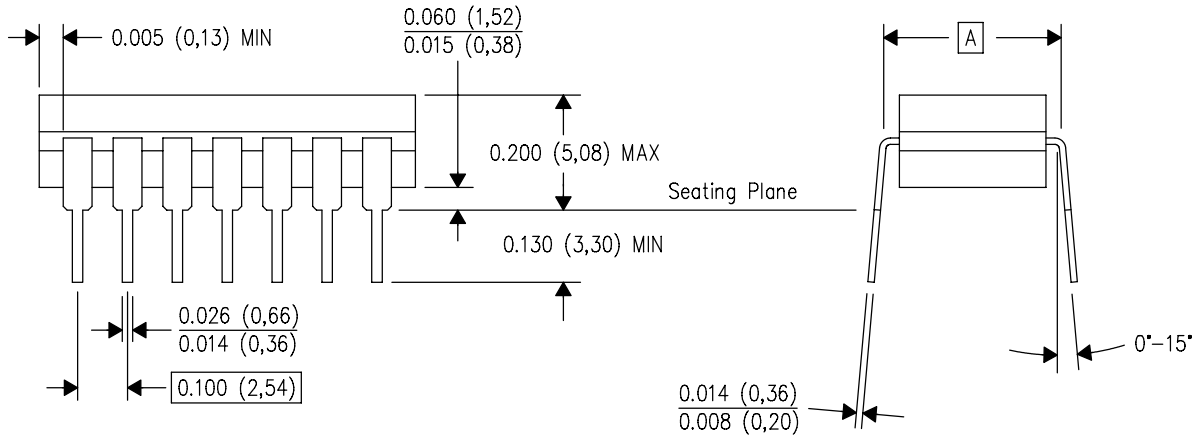
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J (R-GDIP-T\*\*)   
 14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



| DIM \ PINS ** | 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)        |

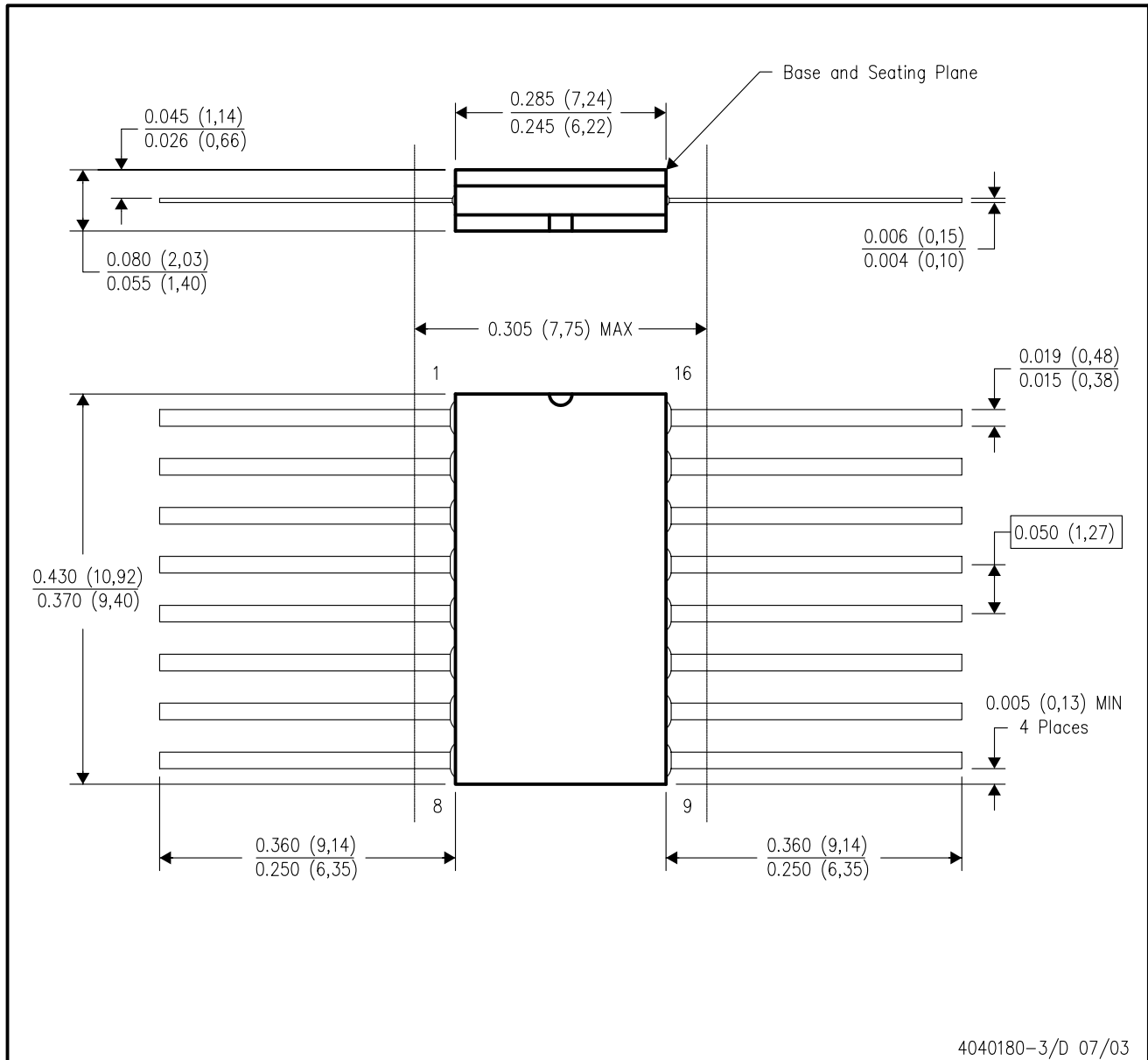


4040083/F 03/03

- 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

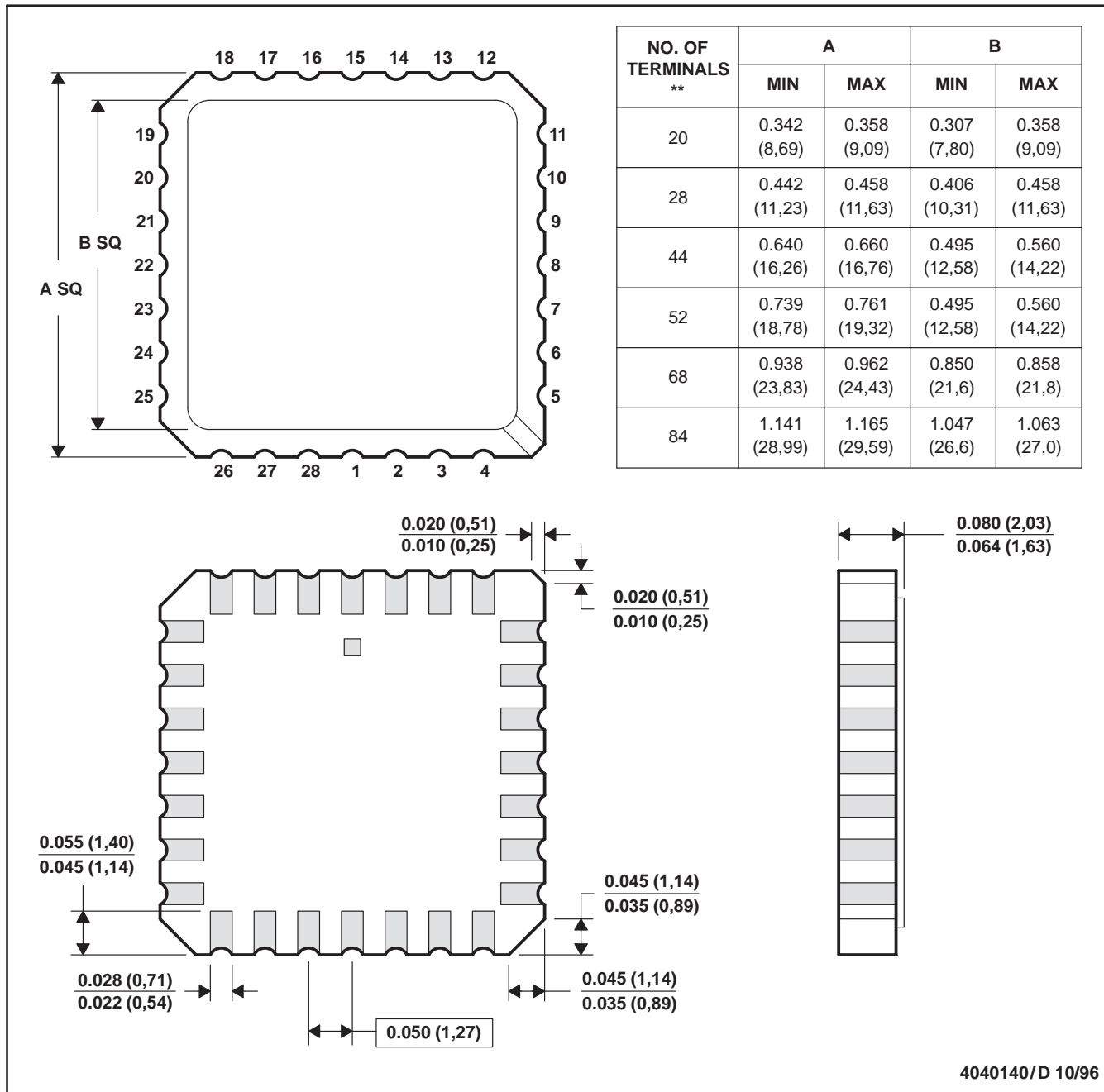


- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only.
  - E. Falls within MIL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

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

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN

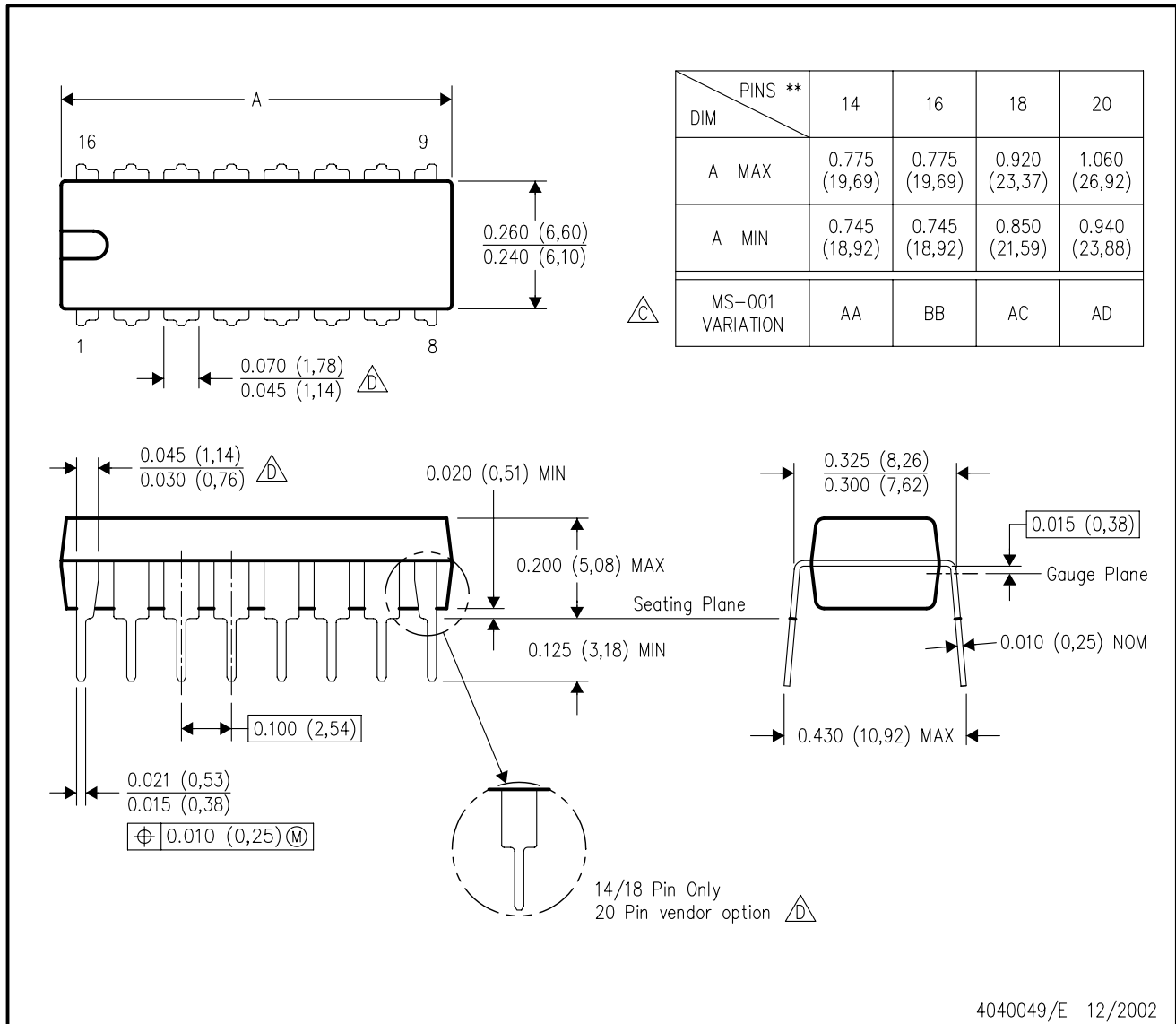


- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a metal lid.
  - D. The terminals are gold plated.
  - E. Falls within JEDEC MS-004

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

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN

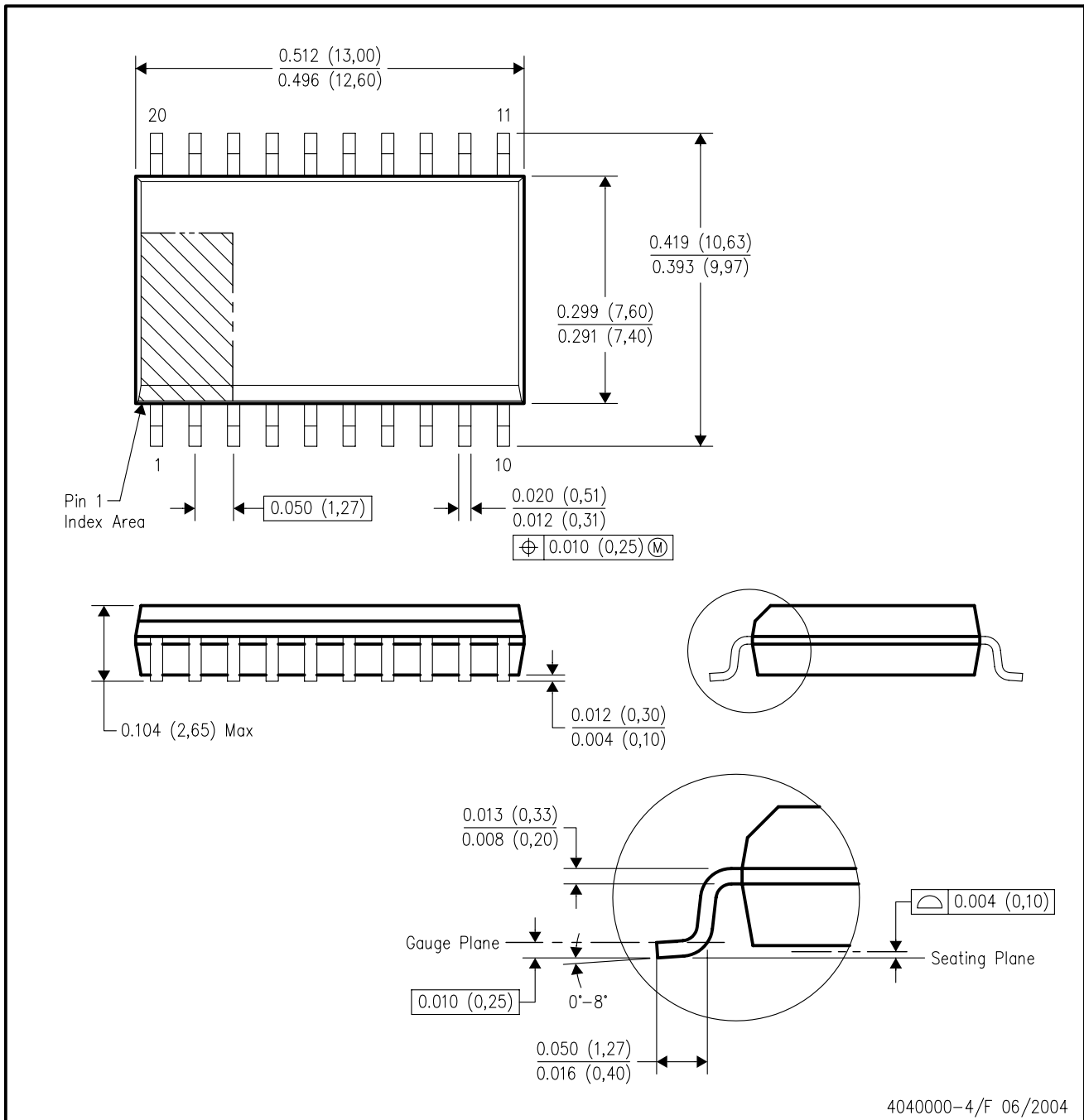


- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - The 20 pin end lead shoulder width is a vendor option, either half or full width.



DW (R-PDSO-G20)

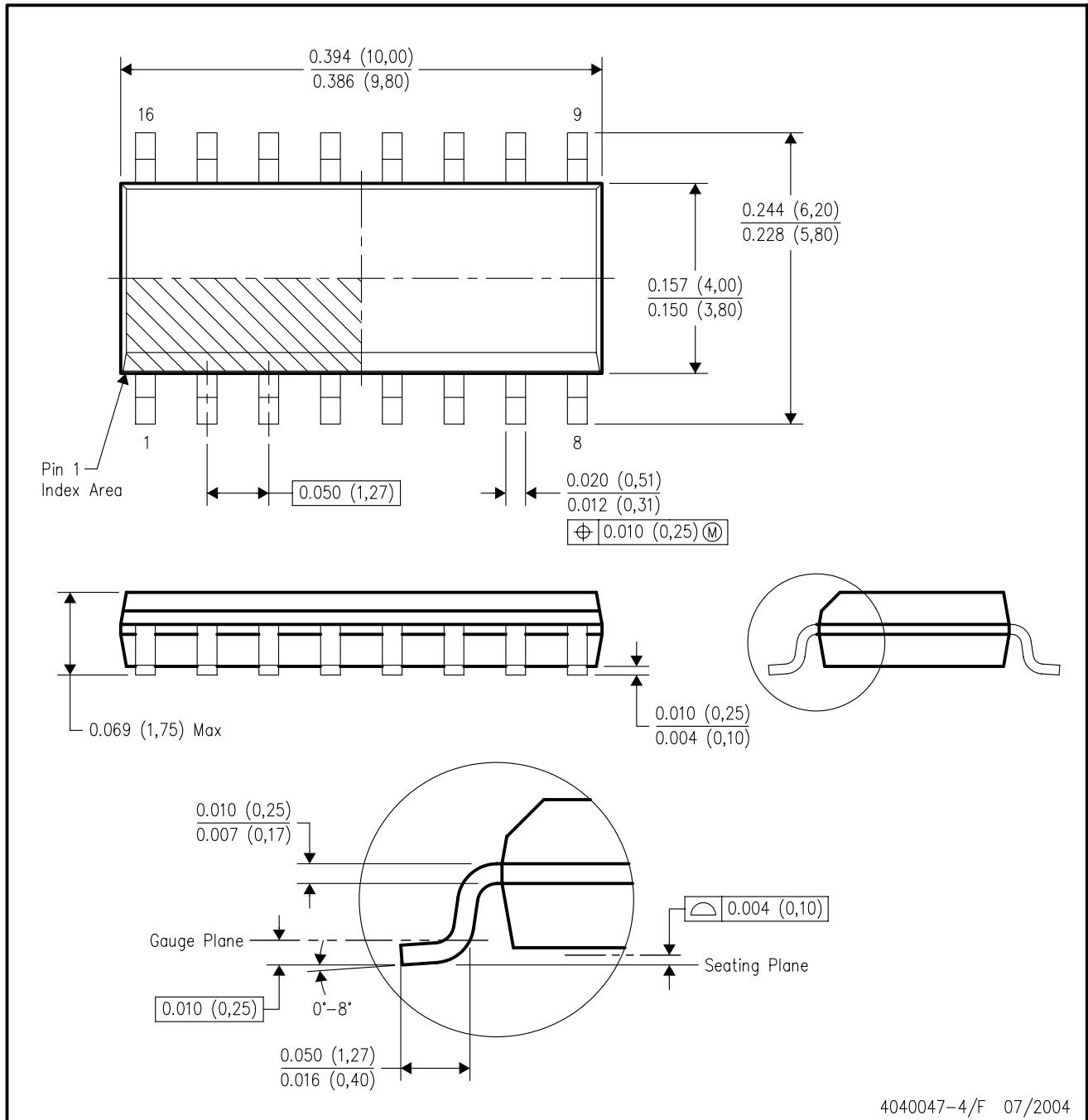
PLASTIC SMALL-OUTLINE PACKAGE



- 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



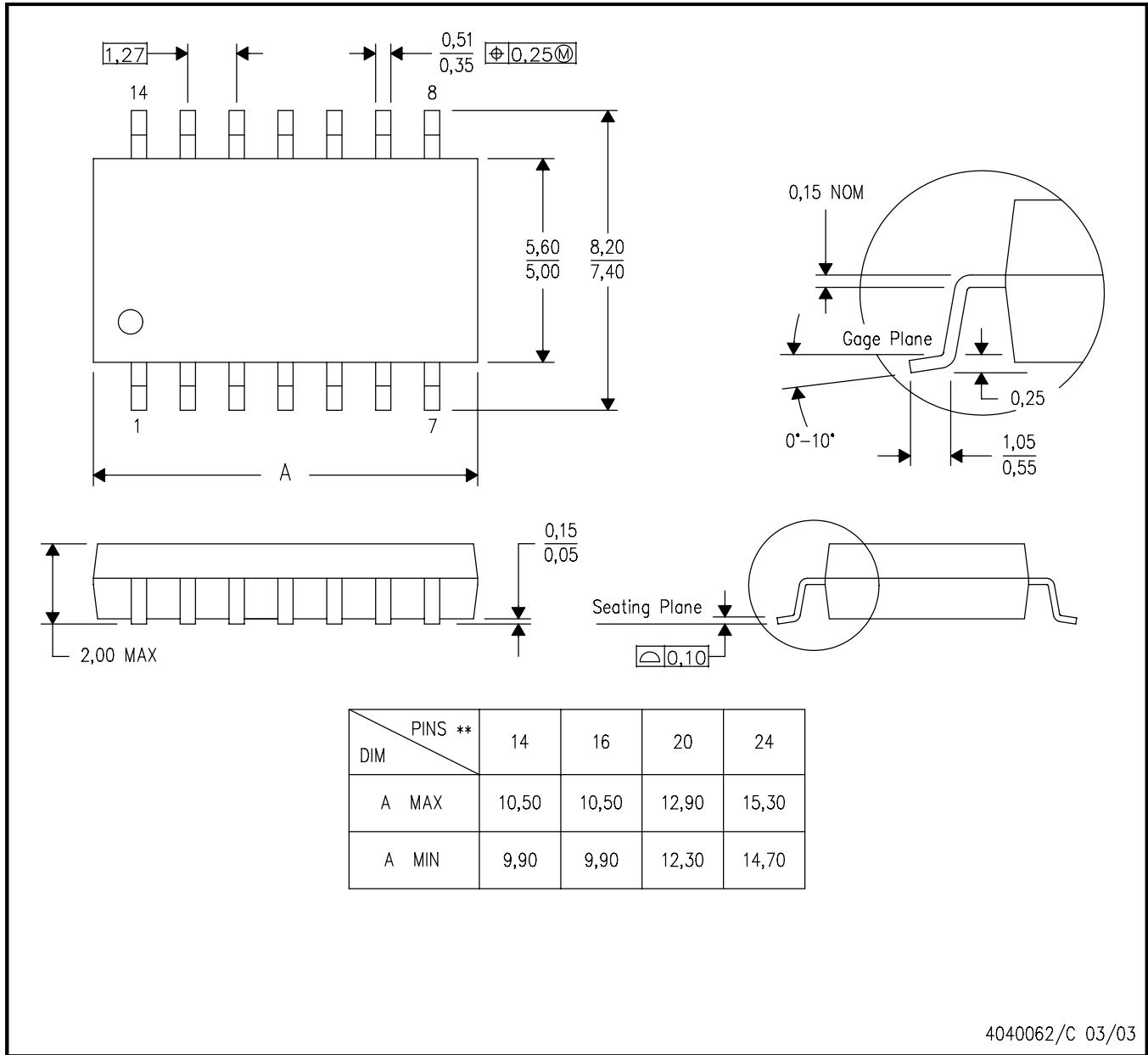
- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - D. Falls within JEDEC MS-012 variation AC.

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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