

# SN5490A, SN5492A, SN5493A, SN54LS90, SN54LS92, SN54LS93 SN7490A, SN7492A, SN7493A, SN74LS90, SN74LS92, SN74LS93 DECADE, DIVIDE-BY-TWELVE AND BINARY COUNTERS

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'90A, 'LS90 . . . Decade Counters

'92A, 'LS92 . . . Divide By-Twelve Counters

'93A, 'LS93 . . . 4-Bit Binary Counters

| TYPES               | TYPICAL<br>POWER DISSIPATION |
|---------------------|------------------------------|
| '90A                | 145 mW                       |
| '92A, '93A          | 130 mW                       |
| 'LS90, 'LS92, 'LS93 | 45 mW                        |

## description

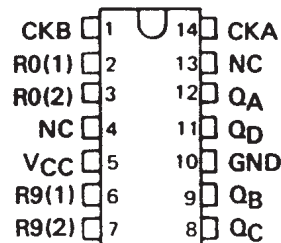
Each of these monolithic counters contains four master-slave flip-flops and additional gating to provide a divide-by-two counter and a three-stage binary counter for which the count cycle length is divide-by-five for the '90A and 'LS90, divide-by-six for the '92A and 'LS92, and the divide-by-eight for the '93A and 'LS93.

All of these counters have a gated zero reset and the '90A and 'LS90 also have gated set-to-nine inputs for use in BCD nine's complement applications.

To use their maximum count length (decade, divide-by-twelve, or four-bit binary) of these counters, the CKB input is connected to the  $Q_A$  output. The input count pulses are applied to CKA input and the outputs are as described in the appropriate function table. A symmetrical divide-by-ten count can be obtained from the '90A or 'LS90 counters by connecting the  $Q_D$  output to the CKA input and applying the input count to the CKB input which gives a divide-by-ten square wave at output  $Q_A$ .

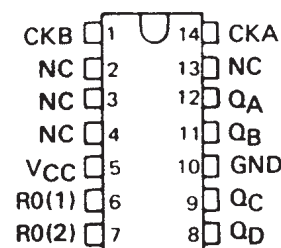
SN5490A, SN54LS90 . . . J OR W PACKAGE  
SN7490A . . . N PACKAGE  
SN74LS90 . . . D OR N PACKAGE

(TOP VIEW)



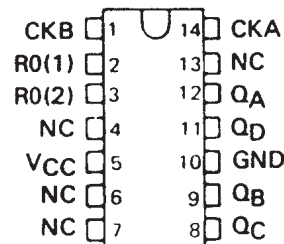
SN5492A, SN54LS92 . . . J OR W PACKAGE  
SN7492A . . . N PACKAGE  
SN74LS92 . . . D OR N PACKAGE

(TOP VIEW)



SN5493A, SN54LS93 . . . J OR W PACKAGE  
SN7493 . . . N PACKAGE  
SN74LS93 . . . D OR N PACKAGE

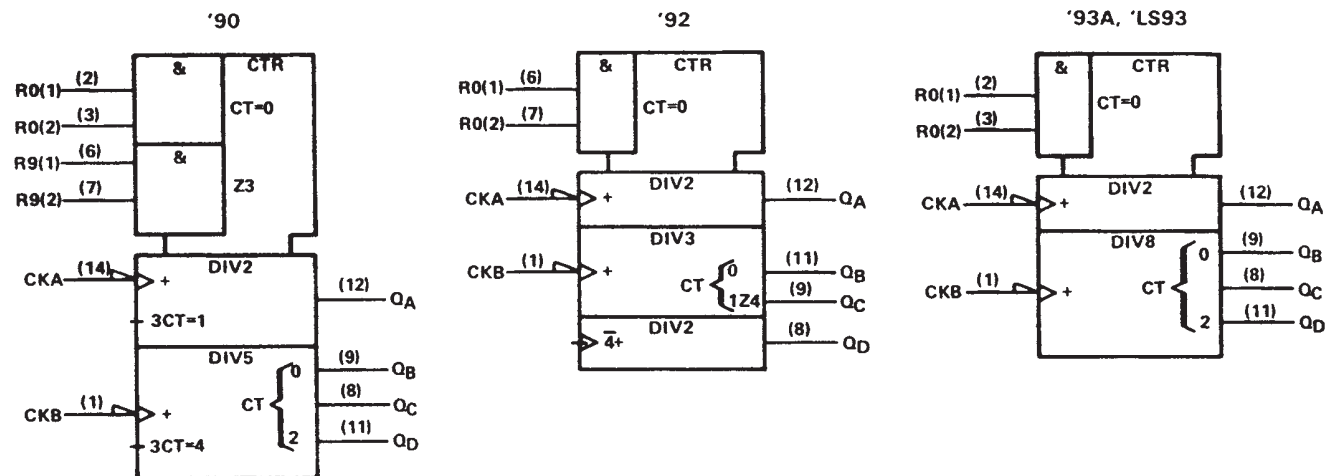
(TOP VIEW)



**SN5490A, SN5492A, SN5493A, SN54LS90, SN54LS92, SN54LS93  
SN7490A, SN7492A, SN7493A, SN74LS90, SN74LS92, SN74LS93  
DECADE, DIVIDE-BY-TWELVE AND BINARY COUNTERS**

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**logic symbols†**



†These symbols are in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.

SN5490A, SN5492A, SN5493A, SN54LS90, SN54LS92, SN54LS93  
 SN7490A, SN7492A, SN7493A, SN74LS90, SN74LS92, SN74LS93  
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'90A, 'LS90  
 BCD COUNT SEQUENCE  
 (See Note A)

| COUNT | OUTPUT         |                |                |                |
|-------|----------------|----------------|----------------|----------------|
|       | Q <sub>D</sub> | Q <sub>C</sub> | Q <sub>B</sub> | Q <sub>A</sub> |
| 0     | L              | L              | L              | L              |
| 1     | L              | L              | L              | H              |
| 2     | L              | L              | H              | L              |
| 3     | L              | L              | H              | H              |
| 4     | L              | H              | L              | L              |
| 5     | L              | H              | L              | H              |
| 6     | L              | H              | H              | L              |
| 7     | L              | H              | H              | H              |
| 8     | H              | L              | L              | L              |
| 9     | H              | L              | L              | H              |

'90A, 'LS90  
 BI-QUINARY (5-2)  
 (See Note B)

| COUNT | OUTPUT         |                |                |                |
|-------|----------------|----------------|----------------|----------------|
|       | Q <sub>A</sub> | Q <sub>D</sub> | Q <sub>C</sub> | Q <sub>B</sub> |
| 0     | L              | L              | L              | L              |
| 1     | L              | L              | L              | H              |
| 2     | L              | L              | H              | L              |
| 3     | L              | L              | H              | H              |
| 4     | L              | H              | L              | L              |
| 5     | H              | L              | L              | L              |
| 6     | H              | L              | L              | H              |
| 7     | H              | L              | H              | L              |
| 8     | H              | L              | H              | H              |
| 9     | H              | H              | L              | L              |

'92A, 'LS92  
 COUNT SEQUENCE  
 (See Note C)

| COUNT | OUTPUT         |                |                |                |
|-------|----------------|----------------|----------------|----------------|
|       | Q <sub>D</sub> | Q <sub>C</sub> | Q <sub>B</sub> | Q <sub>A</sub> |
| 0     | L              | L              | L              | L              |
| 1     | L              | L              | L              | H              |
| 2     | L              | L              | H              | L              |
| 3     | L              | L              | H              | H              |
| 4     | L              | H              | L              | L              |
| 5     | L              | H              | L              | H              |
| 6     | H              | L              | L              | L              |
| 7     | H              | L              | L              | H              |
| 8     | H              | L              | H              | L              |
| 9     | H              | L              | H              | H              |
| 10    | H              | H              | L              | L              |
| 11    | H              | H              | L              | H              |

'90A, 'LS90  
 RESET/COUNT FUNCTION TABLE

| RESET INPUTS       |                    |                    |                    | OUTPUT         |                |                |                |
|--------------------|--------------------|--------------------|--------------------|----------------|----------------|----------------|----------------|
| R <sub>0</sub> (1) | R <sub>0</sub> (2) | R <sub>9</sub> (1) | R <sub>9</sub> (2) | Q <sub>D</sub> | Q <sub>C</sub> | Q <sub>B</sub> | Q <sub>A</sub> |
| H                  | H                  | L                  | X                  | L              | L              | L              | L              |
| H                  | H                  | X                  | L                  | L              | L              | L              | L              |
| X                  | X                  | H                  | H                  | H              | L              | L              | H              |
| X                  | L                  | X                  | L                  | COUNT          |                |                |                |
| L                  | X                  | L                  | X                  | COUNT          |                |                |                |
| L                  | X                  | X                  | L                  | COUNT          |                |                |                |
| X                  | L                  | L                  | X                  | COUNT          |                |                |                |

'93A, 'LS93  
 COUNT SEQUENCE  
 (See Note C)

| COUNT | OUTPUT         |                |                |                |
|-------|----------------|----------------|----------------|----------------|
|       | Q <sub>D</sub> | Q <sub>C</sub> | Q <sub>B</sub> | Q <sub>A</sub> |
| 0     | L              | L              | L              | L              |
| 1     | L              | L              | L              | H              |
| 2     | L              | L              | H              | L              |
| 3     | L              | L              | H              | H              |
| 4     | L              | H              | L              | L              |
| 5     | L              | H              | L              | H              |
| 6     | L              | H              | H              | L              |
| 7     | L              | H              | H              | H              |
| 8     | H              | L              | L              | L              |
| 9     | H              | L              | L              | H              |
| 10    | H              | L              | H              | L              |
| 11    | H              | L              | H              | H              |
| 12    | H              | H              | L              | L              |
| 13    | H              | H              | L              | H              |
| 14    | H              | H              | H              | L              |
| 15    | H              | H              | H              | H              |

'92A, 'LS92, '93A, 'LS93  
 RESET/COUNT FUNCTION TABLE

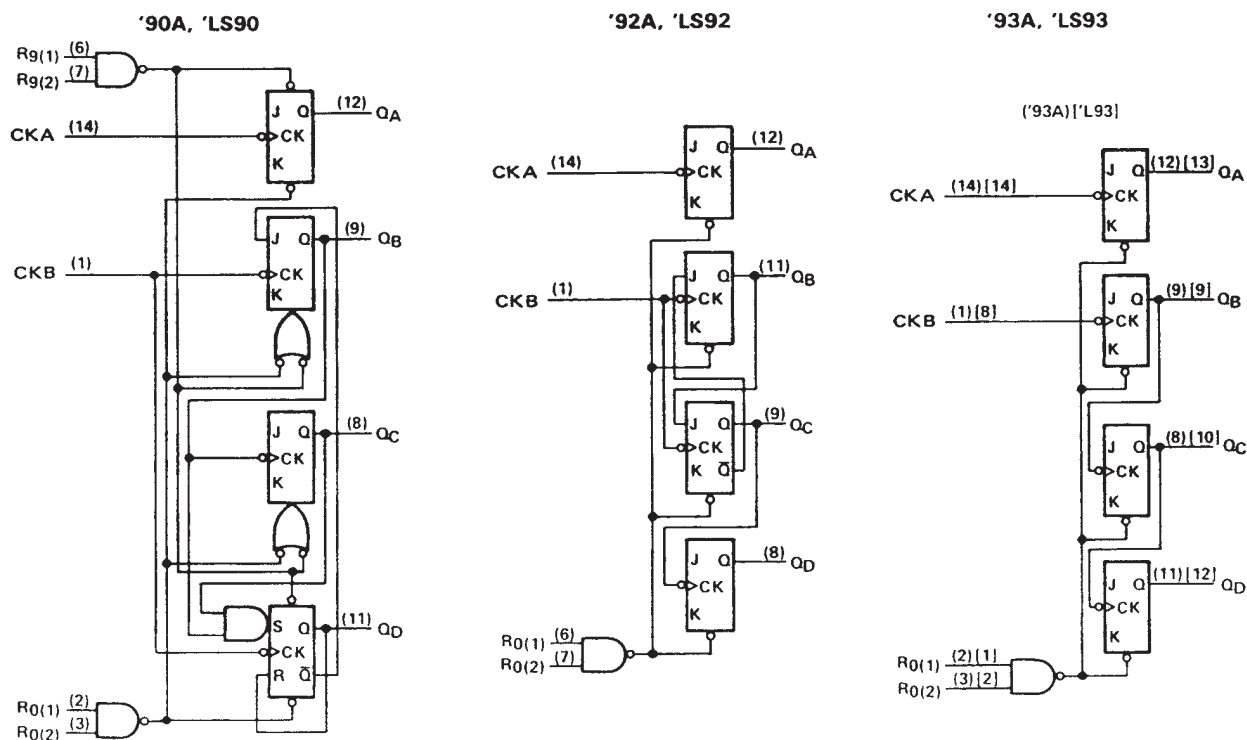
| RESET INPUTS       |                    | OUTPUT         |                |                |                |
|--------------------|--------------------|----------------|----------------|----------------|----------------|
| R <sub>0</sub> (1) | R <sub>0</sub> (2) | Q <sub>D</sub> | Q <sub>C</sub> | Q <sub>B</sub> | Q <sub>A</sub> |
| H                  | H                  | L              | L              | L              | L              |
| L                  | X                  | COUNT          |                |                |                |
| X                  | L                  | COUNT          |                |                |                |

- NOTES: A. Output Q<sub>A</sub> is connected to input CKB for BCD count.  
 B. Output Q<sub>D</sub> is connected to input CKA for bi-quinary count.  
 C. Output Q<sub>A</sub> is connected to input CKB.  
 D. H = high level, L = low level, X = irrelevant

# SN5490A, SN5492A, SN5493A, SN54LS90, SN54LS92, SN54LS93 SN7490A, SN7492A, SN7493A, SN74LS90, SN74LS92, SN74LS93 DECADE, DIVIDE-BY-TWELVE AND BINARY COUNTERS

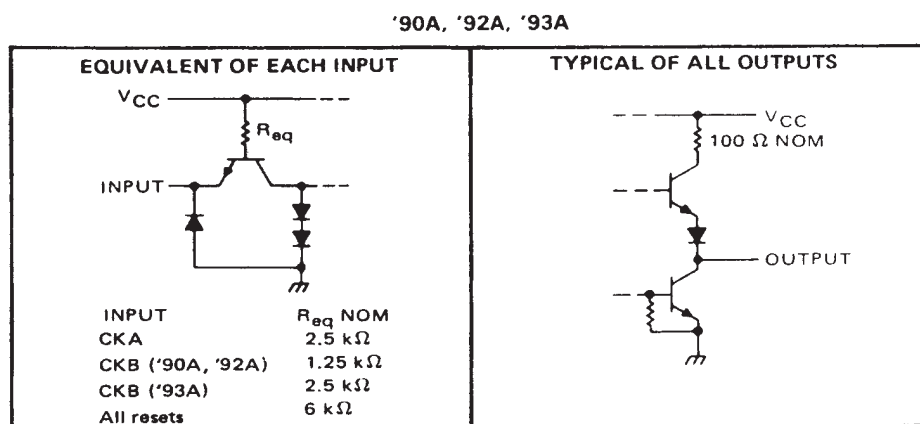
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## logic diagrams (positive logic)



The J and K inputs shown without connection are for reference only and are functionally at a high level.  
Pin numbers shown in ( ) are for the 'LS93 and '93A and pin numbers shown in [ ] are for the '54LS93.

## schematics of inputs and outputs

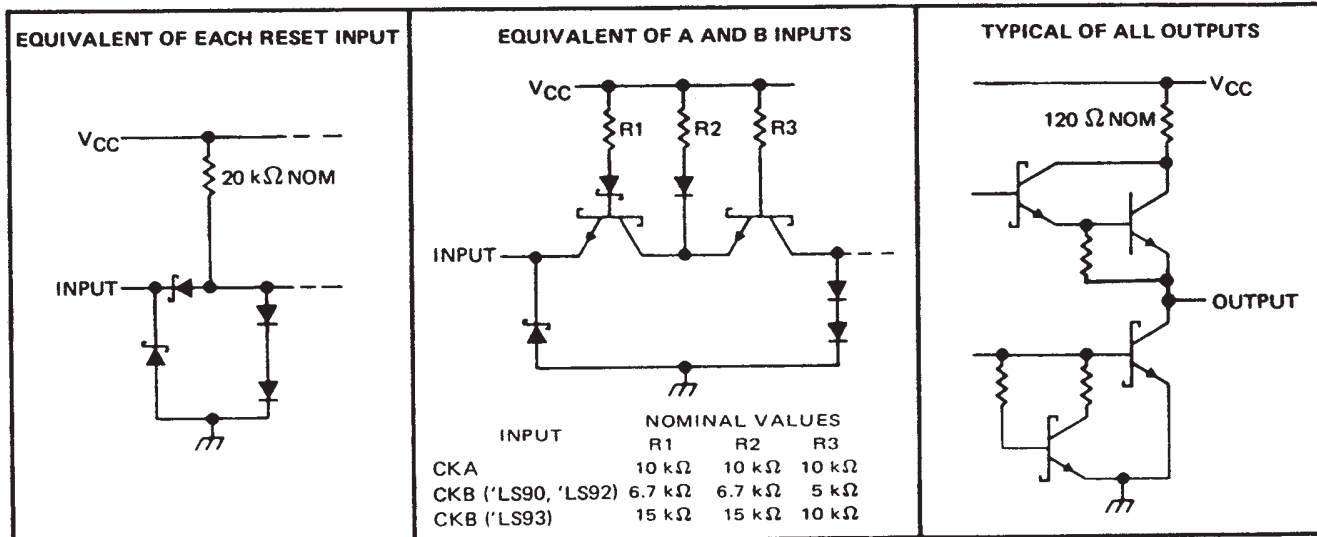


SN5490A, SN5492A, SN5493A, SN54LS90, SN54LS92, SN54LS93  
 SN7490A, SN7492A, SN7493A, SN74LS90, SN74LS92, SN74LS93  
 DECADE, DIVIDE-BY-TWELVE AND BINARY COUNTERS

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schematics of inputs and outputs (continued)

'LS90, 'LS92, 'LS93



# SN5490A, SN5492A, SN5493A, SN54LS90, SN54LS92, SN54LS93 SN7490A, SN7492A, SN7493A, SN74LS90, SN74LS92, SN74LS93 DECADE, DIVIDE-BY-TWELVE AND BINARY COUNTERS

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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                                                   | 5.5 V          |
| Interemitter voltage (see Note 2)                               | 5.5 V          |
| Operating free-air temperature range: SN5490A, SN5492A, SN5493A | –55°C to 125°C |
| SN7490A, SN7492A, SN7493A                                       | 0°C to 70°C    |
| Storage temperature range                                       | –65°C to 150°C |

NOTES: 1. Voltage values, except interemitter voltage, are with respect to network ground terminal.

2. This is the voltage between two emitters of a multiple-emitter transistor. For these circuits, this rating applies between the two  $R_0$  inputs, and for the '90A circuit, it also applies between the two  $R_0$  inputs.

## recommended operating conditions

|                                             |              | SN5490A, SN5492A<br>SN5493A |     |      | SN7490A, SN7492A<br>SN7493A |     |      | UNIT    |
|---------------------------------------------|--------------|-----------------------------|-----|------|-----------------------------|-----|------|---------|
|                                             |              | MIN                         | NOM | MAX  | MIN                         | NOM | MAX  |         |
| Supply voltage, $V_{CC}$                    |              | 4.5                         | 5   | 5.5  | 4.75                        | 5   | 5.25 | V       |
| High-level output current, $I_{OH}$         |              |                             |     | –800 |                             |     | –800 | $\mu$ A |
| Low-level output current, $I_{OL}$          |              |                             |     | 16   |                             |     | 16   | mA      |
| Count frequency, $f_{count}$ (see Figure 1) | A input      | 0                           |     | 32   | 0                           |     | 32   | MHz     |
|                                             | B input      | 0                           |     | 16   | 0                           |     | 16   |         |
| Pulse width, $t_w$                          | A input      | 15                          |     |      | 15                          |     |      | ns      |
|                                             | B input      | 30                          |     |      | 30                          |     |      |         |
|                                             | Reset inputs | 15                          |     |      | 15                          |     |      |         |
| Reset inactive-state setup time, $t_{SU}$   |              | 25                          |     |      | 25                          |     |      | ns      |
| Operating free-air temperature, $T_A$       |              | –55                         |     | 125  | 0                           |     | 70   | °C      |

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

| PARAMETER ¶     |                                        | TEST CONDITIONS†                                                                                    |                                               | '90A |      |     | '92A |      |     | '93A |      |     | UNIT |
|-----------------|----------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------|------|------|-----|------|------|-----|------|------|-----|------|
|                 |                                        |                                                                                                     |                                               | MIN  | TYP‡ | MAX | MIN  | TYP‡ | MAX | MIN  | TYP‡ | MAX |      |
| V <sub>IH</sub> | High-level input voltage               |                                                                                                     |                                               | 2    |      |     | 2    |      |     | 2    |      |     | V    |
| V <sub>IL</sub> | Low-level input voltage                |                                                                                                     |                                               | 0.8  |      |     | 0.8  |      |     | 0.8  |      |     | V    |
| V <sub>IK</sub> | Input clamp voltage                    | V <sub>CC</sub> = MIN, I <sub>I</sub> = –12 mA                                                      |                                               | –1.5 |      |     | –1.5 |      |     | –1.5 |      |     | V    |
| V <sub>OH</sub> | High-level output voltage              | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V,<br>V <sub>IL</sub> = 0.8 V, I <sub>OH</sub> = –800 µA |                                               | 2.4  | 3.4  |     | 2.4  | 3.4  |     | 2.4  | 3.4  |     | V    |
| V <sub>OL</sub> | Low-level output voltage               | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V,<br>V <sub>IL</sub> = 0.8 V, I <sub>OL</sub> = 16 mA¶  |                                               |      | 0.2  | 0.4 |      | 0.2  | 0.4 |      | 0.2  | 0.4 | V    |
| I <sub>I</sub>  | Input current at maximum input voltage | V <sub>CC</sub> = MAX, V <sub>I</sub> = 5.5 V                                                       |                                               | 1    |      |     | 1    |      |     | 1    |      |     | mA   |
| I <sub>IH</sub> | High-level input current               | Any reset                                                                                           | V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.4 V | 40   |      |     | 40   |      |     | 40   |      |     | µA   |
|                 |                                        | CKA                                                                                                 |                                               | 80   |      |     | 80   |      |     | 80   |      |     |      |
|                 |                                        | CKB                                                                                                 |                                               | 120  |      |     | 120  |      |     | 80   |      |     |      |
| I <sub>IL</sub> | Low-level input current                | Any reset                                                                                           | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V | –1.6 |      |     | –1.6 |      |     | –1.6 |      |     | mA   |
|                 |                                        | CKA                                                                                                 |                                               | –3.2 |      |     | –3.2 |      |     | –3.2 |      |     |      |
|                 |                                        | CKB                                                                                                 |                                               | –4.8 |      |     | –4.8 |      |     | –3.2 |      |     |      |
| I <sub>OS</sub> | Short-circuit output current §         | V <sub>CC</sub> = MAX                                                                               | SN54'                                         | –20  | –57  | –20 | –57  | –20  | –57 |      |      |     | mA   |
|                 |                                        |                                                                                                     | SN74'                                         | –18  | –57  | –18 | –57  | –18  | –57 |      |      |     |      |
| I <sub>CC</sub> | Supply current                         | V <sub>CC</sub> = MAX, See Note 3                                                                   |                                               |      | 29   | 42  |      | 26   | 39  |      | 26   | 39  | mA   |

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

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

<sup>§</sup> Not more than one output should be shorted at a time.

<sup>¶</sup>  $I_{OH}$  outputs are tested at  $I_{OL} = 16 \text{ mA}$  plus the limit value for  $I_{IL}$  for the CKB input. This permits driving the CKB input while maintaining full fan-out capability.

NOTE 3:  $I_{CC}$  is measured with all outputs open, both  $R_0$  inputs grounded following momentary connection to 4.5 V, and all other inputs grounded.



SN5490A, SN5492A, SN5493A, SN54LS90, SN54LS92, SN54LS93  
 SN7490A, SN7492A, SN7493A, SN74LS90, SN74LS92, SN74LS93  
 DECADE, DIVIDE-BY-TWELVE AND BINARY COUNTERS

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switching characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$

| PARAMETER†       | FROM<br>(INPUT) | TO<br>(OUTPUT)                  | TEST CONDITIONS                                                    | '90A |     |     | '92A |     |     | '93A |     |     | UNIT |
|------------------|-----------------|---------------------------------|--------------------------------------------------------------------|------|-----|-----|------|-----|-----|------|-----|-----|------|
|                  |                 |                                 |                                                                    | MIN  | TYP | MAX | MIN  | TYP | MAX | MIN  | TYP | MAX |      |
| f <sub>max</sub> | CKA             | Q <sub>A</sub>                  | C <sub>L</sub> = 15 pF,<br>R <sub>L</sub> = 400 Ω,<br>See Figure 1 | 32   | 42  |     | 32   | 42  |     | 32   | 42  |     | MHz  |
|                  | CKB             | Q <sub>B</sub>                  |                                                                    | 16   |     |     | 16   |     |     | 16   |     |     |      |
| t <sub>PLH</sub> | CKA             | Q <sub>A</sub>                  |                                                                    | 10   | 16  |     | 10   | 16  |     | 10   | 16  |     | ns   |
| t <sub>PHL</sub> |                 |                                 |                                                                    | 12   | 18  |     | 12   | 18  |     | 12   | 18  |     |      |
| t <sub>PLH</sub> | CKA             | Q <sub>D</sub>                  |                                                                    | 32   | 48  |     | 32   | 48  |     | 46   | 70  |     | ns   |
| t <sub>PHL</sub> |                 |                                 |                                                                    | 34   | 50  |     | 34   | 50  |     | 46   | 70  |     |      |
| t <sub>PLH</sub> | CKB             | Q <sub>B</sub>                  |                                                                    | 10   | 16  |     | 10   | 16  |     | 10   | 16  |     | ns   |
| t <sub>PHL</sub> |                 |                                 |                                                                    | 14   | 21  |     | 14   | 21  |     | 14   | 21  |     |      |
| t <sub>PLH</sub> | CKB             | Q <sub>C</sub>                  |                                                                    | 21   | 32  |     | 10   | 16  |     | 21   | 32  |     | ns   |
| t <sub>PHL</sub> |                 |                                 |                                                                    | 23   | 35  |     | 14   | 21  |     | 23   | 35  |     |      |
| t <sub>PLH</sub> | CKB             | Q <sub>D</sub>                  |                                                                    | 21   | 32  |     | 21   | 32  |     | 34   | 51  |     | ns   |
| t <sub>PHL</sub> |                 |                                 |                                                                    | 23   | 35  |     | 23   | 35  |     | 34   | 51  |     |      |
| t <sub>PHL</sub> | Set-to-0        | Any                             |                                                                    | 26   | 40  |     | 26   | 40  |     | 26   | 40  |     | ns   |
| t <sub>PLH</sub> | Set-to-9        | Q <sub>A</sub> , Q <sub>D</sub> |                                                                    | 20   | 30  |     |      |     |     |      |     |     | ns   |
| t <sub>PHI</sub> |                 | Q <sub>B</sub> , Q <sub>C</sub> |                                                                    | 26   | 40  |     |      |     |     |      |     |     |      |

†  $f_{\max}$  = maximum count frequency

$t_{PLH}$  = propagation delay time, low-to-high-level output

$t_{PHL}$  = propagation delay time, high-to-low-level output

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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: R inputs                                | 7 V            |
| A and B inputs                                         | 5.5 V          |
| Operating free-air temperature range: SN54LS* Circuits | –55°C to 125°C |
| SN74LS* Circuits                                       | 0°C to 70°C    |
| Storage temperature range                              | –65°C to 150°C |

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

recommended operating conditions

|                                             |              | SN54LS90<br>SN54LS92<br>SN54LS93 |     |     | SN74LS90<br>SN74LS92<br>SN74LS93 |     |      | UNIT    |
|---------------------------------------------|--------------|----------------------------------|-----|-----|----------------------------------|-----|------|---------|
|                                             |              | MIN                              | NOM | MAX | MIN                              | NOM | MAX  |         |
| Supply voltage, $V_{CC}$                    |              | 4.5                              | 5   | 5.5 | 4.75                             | 5   | 5.25 | V       |
| High-level output current, $I_{OH}$         |              | –400                             |     |     | –400                             |     |      | $\mu$ A |
| Low-level output current, $I_{OL}$          |              | 4                                |     |     | 8                                |     |      | mA      |
| Count frequency, $f_{count}$ (see Figure 1) | A input      | 0                                |     | 32  | 0                                |     | 32   | MHz     |
|                                             | B input      | 0                                |     | 16  | 0                                |     | 16   |         |
| Pulse width, $t_w$                          | A input      | 15                               |     |     | 15                               |     |      | ns      |
|                                             | B input      | 30                               |     |     | 30                               |     |      |         |
|                                             | Reset inputs | 30                               |     |     | 30                               |     |      |         |
| Reset inactive-state setup time, $t_{su}$   |              | 25                               |     |     | 25                               |     |      | ns      |
| Operating free-air temperature, $T_A$       |              | –55                              |     | 125 | 0                                |     | 70   | °C      |

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

| PARAMETER       |                                        |           | TEST CONDITIONS†                                                                                               |  | SN54LS90<br>SN54LS92    |          |     | SN74LS90<br>SN74LS92 |      |     | UNIT |
|-----------------|----------------------------------------|-----------|----------------------------------------------------------------------------------------------------------------|--|-------------------------|----------|-----|----------------------|------|-----|------|
|                 |                                        |           |                                                                                                                |  | MIN                     | TYP‡     | MAX | MIN                  | TYP‡ | MAX |      |
| V <sub>IH</sub> | High-level input voltage               |           |                                                                                                                |  | 2                       |          |     | 2                    |      |     | V    |
| V <sub>IL</sub> | Low-level input voltage                |           |                                                                                                                |  | 0.7                     |          |     | 0.8                  |      |     | V    |
| V <sub>IK</sub> | Input clamp voltage                    |           | V <sub>CC</sub> = MIN, I <sub>I</sub> = −18 mA                                                                 |  | −1.5                    |          |     | −1.5                 |      |     | V    |
| V <sub>OH</sub> | High-level output voltage              |           | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = V <sub>IL</sub> max, I <sub>OH</sub> = −400 μA |  | 2.5 3.4                 |          |     | 2.7 3.4              |      |     | V    |
| V <sub>OL</sub> | Low-level output voltage               |           | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = V <sub>IL</sub> max,                           |  | I <sub>OL</sub> = 4 mA¶ |          |     | 0.25 0.4             |      |     | V    |
|                 |                                        |           | I <sub>OL</sub> = 8 mA¶                                                                                        |  |                         | 0.35 0.5 |     |                      |      |     |      |
| I <sub>I</sub>  | Input current at maximum input voltage | Any reset | V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V                                                                    |  | 0.1                     |          |     | 0.1                  |      |     | mA   |
|                 |                                        | CKA       | V <sub>CC</sub> = MAX, V <sub>I</sub> = 5.5 V                                                                  |  | 0.2                     |          |     | 0.2                  |      |     |      |
|                 |                                        | CKB       |                                                                                                                |  | 0.4                     |          |     | 0.4                  |      |     |      |
| I <sub>IH</sub> | High-level input current               | Any reset | V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V                                                                  |  | 20                      |          |     | 20                   |      |     | μA   |
|                 |                                        | CKA       |                                                                                                                |  | 40                      |          |     | 40                   |      |     |      |
|                 |                                        | CKB       |                                                                                                                |  | 80                      |          |     | 80                   |      |     |      |
| I <sub>IL</sub> | Low-level input current                | Any reset | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V                                                                  |  | −0.4                    |          |     | −0.4                 |      |     | mA   |
|                 |                                        | CKA       |                                                                                                                |  | −2.4                    |          |     | −2.4                 |      |     |      |
|                 |                                        | CKB       |                                                                                                                |  | −3.2                    |          |     | −3.2                 |      |     |      |
| I <sub>OS</sub> | Short-circuit output current§          |           | V <sub>CC</sub> = MAX                                                                                          |  | −20 −100                |          |     | −20 −100             |      |     | mA   |
| I <sub>CC</sub> | Supply current                         |           | V <sub>CC</sub> = MAX, See Note 3                                                                              |  | 'LS90                   | 9 15     |     | 9 15                 |      | mA  |      |
|                 |                                        |           |                                                                                                                |  | 'LS92                   | 9 15     |     | 9 15                 |      |     |      |

† 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 duration of the short-circuit should not exceed one second.

¶  $I_{QA}$  outputs are tested at specified  $I_{OL}$  plus the limit value of  $I_{IL}$  for the CKB input. This permits driving the CKB input while maintaining full fan-out capability.

NOTE 3:  $I_{CC}$  is measured with all outputs open, both  $R_O$  inputs grounded following momentary connection to 4.5 V, and all other inputs grounded.



SN5490A, SN5492A, SN5493A, SN54LS90, SN54LS92, SN54LS93  
SN7490A, SN7492A, SN7493A, SN74LS90, SN74LS92, SN74LS93  
DECADE, DIVIDE-BY-TWELVE AND BINARY COUNTERS

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

| PARAMETER       |                                        |            | TEST CONDITIONS†                                                                                               | SN54LS93 |      |      | SN74LS93 |      |      | UNIT |
|-----------------|----------------------------------------|------------|----------------------------------------------------------------------------------------------------------------|----------|------|------|----------|------|------|------|
|                 |                                        |            |                                                                                                                | MIN      | TYP‡ | MAX  | MIN      | TYP‡ | MAX  |      |
| V <sub>IH</sub> | High-level input voltage               |            |                                                                                                                | 2        |      |      | 2        |      |      | V    |
| V <sub>IL</sub> | Low-level input voltage                |            |                                                                                                                |          |      | 0.7  |          |      | 0.8  | V    |
| V <sub>IK</sub> | Input clamp voltage                    |            | V <sub>CC</sub> = MIN, I <sub>I</sub> = -18 mA                                                                 |          |      | -1.5 |          |      | -1.5 | V    |
| V <sub>OH</sub> | High-level output voltage              |            | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = V <sub>IL</sub> max, I <sub>OH</sub> = -400 µA | 2.5      | 3.4  |      | 2.7      | 3.4  |      | V    |
| V <sub>OL</sub> | Low-level output voltage               |            | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, I <sub>OL</sub> = 4 mA¶                                          | 0.25     | 0.4  |      | 0.25     | 0.4  |      | V    |
|                 |                                        |            | V <sub>IL</sub> = V <sub>IL</sub> max, I <sub>OL</sub> = 8 mA¶                                                 |          |      |      | 0.35     | 0.5  |      |      |
| I <sub>I</sub>  | Input current at maximum input voltage | Any reset  | V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V                                                                    |          |      | 0.1  |          |      | 0.1  | mA   |
|                 |                                        | CKA or CKB | V <sub>CC</sub> = MAX, V <sub>I</sub> = 5.5 V                                                                  |          |      | 0.2  |          |      | 0.2  |      |
| I <sub>IH</sub> | High-level input current               | Any reset  | V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V                                                                  |          |      | 20   |          |      | 20   | µA   |
|                 |                                        | CKA or CKB |                                                                                                                |          |      | 40   |          |      | 80   |      |
| I <sub>IL</sub> | Low-level input current                | Any reset  | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V                                                                  |          |      | -0.4 |          |      | -0.4 | mA   |
|                 |                                        | CKA        |                                                                                                                |          |      | -2.4 |          |      | -2.4 |      |
|                 |                                        | CKB        |                                                                                                                |          |      | -1.6 |          |      | -1.6 |      |
| I <sub>OS</sub> | Short-circuit output current§          |            | V <sub>CC</sub> = MAX                                                                                          | -20      |      | -100 | -20      |      | -100 | mA   |
| I <sub>CC</sub> | Supply current                         |            | V <sub>CC</sub> = MAX, See Note 3                                                                              | 9        | 15   |      | 9        | 15   |      | mA   |

†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 duration of the short-circuit should not exceed one second.

¶Q<sub>A</sub> outputs are tested at specified I<sub>OL</sub> plus the limit value for I<sub>IL</sub> for the CKB input. This permits driving the CKB input while maintaining full fan-out capability.

NOTE 3: I<sub>CC</sub> is measured with all outputs open, both R<sub>Q</sub> inputs grounded following momentary connection to 4.5 V, and all other inputs grounded.

switching characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C

| PARAMETER#       | FROM<br>(INPUT) | TO<br>(OUTPUT)                  | TEST CONDITIONS                                                  | 'LS90 |     |     | 'LS92 |     |     | 'LS93 |     |     | UNIT |
|------------------|-----------------|---------------------------------|------------------------------------------------------------------|-------|-----|-----|-------|-----|-----|-------|-----|-----|------|
|                  |                 |                                 |                                                                  | MIN   | TYP | MAX | MIN   | TYP | MAX | MIN   | TYP | MAX |      |
| f <sub>max</sub> | CKA             | Q <sub>A</sub>                  | C <sub>L</sub> = 15 pF,<br>R <sub>L</sub> = 2 kΩ<br>See Figure 1 | 32    | 42  |     | 32    | 42  |     | 32    | 42  |     | MHz  |
|                  | CKB             | Q <sub>B</sub>                  |                                                                  | 16    |     |     | 16    |     |     | 16    |     |     |      |
| t <sub>PLH</sub> | CKA             | Q <sub>A</sub>                  |                                                                  | 10    | 16  |     | 10    | 16  |     | 10    | 16  |     | ns   |
| t <sub>PHL</sub> |                 |                                 |                                                                  | 12    | 18  |     | 12    | 18  |     | 12    | 18  |     |      |
| t <sub>PLH</sub> | CKA             | Q <sub>D</sub>                  |                                                                  | 32    | 48  |     | 32    | 48  |     | 46    | 70  |     | ns   |
| t <sub>PHL</sub> |                 |                                 |                                                                  | 34    | 50  |     | 34    | 50  |     | 46    | 70  |     |      |
| t <sub>PLH</sub> | CKB             | Q <sub>B</sub>                  |                                                                  | 10    | 16  |     | 10    | 16  |     | 10    | 16  |     | ns   |
| t <sub>PHL</sub> |                 |                                 |                                                                  | 14    | 21  |     | 14    | 21  |     | 14    | 21  |     |      |
| t <sub>PLH</sub> | CKB             | Q <sub>C</sub>                  |                                                                  | 21    | 32  |     | 10    | 16  |     | 21    | 32  |     | ns   |
| t <sub>PHL</sub> |                 |                                 |                                                                  | 23    | 35  |     | 14    | 21  |     | 23    | 35  |     |      |
| t <sub>PLH</sub> | CKB             | Q <sub>D</sub>                  |                                                                  | 21    | 32  |     | 21    | 32  |     | 34    | 51  |     | ns   |
| t <sub>PHL</sub> |                 |                                 |                                                                  | 23    | 35  |     | 23    | 35  |     | 34    | 51  |     |      |
| t <sub>PHL</sub> | Set-to-0        | Any                             |                                                                  | 26    | 40  |     | 26    | 40  |     | 26    | 40  |     | ns   |
| t <sub>PLH</sub> | Set-to-9        | Q <sub>A</sub> , Q <sub>D</sub> |                                                                  | 20    | 30  |     |       |     |     |       |     |     | ns   |
| t <sub>PHI</sub> |                 | Q <sub>B</sub> , Q <sub>C</sub> |                                                                  | 26    | 40  |     |       |     |     |       |     |     |      |

#f<sub>max</sub> = maximum count frequency

t<sub>PLH</sub> = propagation delay time, low-to-high-level output

t<sub>PHL</sub> = propagation delay time, high-to-low-level output



TEXAS  
INSTRUMENTS

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# SN5490A, SN5492A, SN5493A, SN54LS90, SN54LS92, SN54LS93 SN7490A, SN7492A, SN7493A, SN74LS90, SN74LS92, SN74LS93 DECADE, DIVIDE-BY-TWELVE AND BINARY COUNTERS

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## PARAMETER MEASUREMENT INFORMATION



NOTES: A. Input pulses are supplied by a generator having the following characteristics:

for '90A, '92A, '93A,  $t_r \leq 5$  ns,  $t_f \leq 5$  ns, PRR = 1 MHz, duty cycle = 50%,  $Z_{out} \approx 50$  ohms;  
for 'LS90, 'LS92, 'LS93,  $t_r \leq 15$  ns,  $t_f \leq 5$  ns, PRR = 1 MHz, duty cycle = 50%,  $Z_{out} \approx 50$  ohms.

B.  $C_L$  includes probe and jig capacitance.

C. All diodes are 1N3064 or equivalent.

D. Each reset input is tested separately with the other reset at 4.5 V.

E. Reference waveforms are shown with dashed lines.

F. For '90A, '92A, and '93A;  $V_{ref} = 1.5$  V. For 'LS90, 'LS92, and 'LS93;  $V_{ref} = 1.3$  V.

FIGURE 1A

## PARAMETER MEASUREMENT INFORMATION



- NOTES: A. Input pulses are supplied by a generator having the following characteristics:  
 for '90A, '92A, '93A,  $t_r \leq 5$  ns,  $t_f \leq 5$  ns, PRR = 1 MHz, duty cycle = 50%,  $Z_{out} \approx 50$  ohms;  
 for 'LS90, 'LS92, 'LS93,  $t_r \leq 15$  ns,  $t_f \leq 5$  ns, PRR = 1 MHz, duty cycle = 50%,  $Z_{out} \approx 50$  ohms.
- B.  $C_L$  includes probe and jig capacitance.
- C. All diodes are 1N3064 or equivalent.
- D. Each reset input is tested separately with the other reset at 4.5 V.
- E. Reference waveforms are shown with dashed lines.
- F. For '90A, '92A, and '93A;  $V_{ref} = 1.5$  V. For 'LS90, 'LS92, and 'LS93;  $V_{ref} = 1.3$  V.

FIGURE 1B

## PACKAGING INFORMATION

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)     | Lead finish/<br>Ball material<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|---------------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| 7603201CA        | ACTIVE        | CDIP         | J                  | 14   | 1              | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | 7603201CA<br>SNJ54LS90J | <a href="#">Samples</a> |
| 7700101CA        | ACTIVE        | CDIP         | J                  | 14   | 1              | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | 7700101CA<br>SNJ54LS93J | <a href="#">Samples</a> |
| 7700101DA        | ACTIVE        | CFP          | W                  | 14   | 1              | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | 7700101DA<br>SNJ54LS93W | <a href="#">Samples</a> |
| JM38510/31501BCA | ACTIVE        | CDIP         | J                  | 14   | 1              | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>31501BCA    | <a href="#">Samples</a> |
| JM38510/31502BCA | ACTIVE        | CDIP         | J                  | 14   | 1              | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>31502BCA    | <a href="#">Samples</a> |
| JM38510/31502BDA | ACTIVE        | CFP          | W                  | 14   | 1              | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>31502BDA    | <a href="#">Samples</a> |
| M38510/31501BCA  | ACTIVE        | CDIP         | J                  | 14   | 1              | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>31501BCA    | <a href="#">Samples</a> |
| M38510/31502BCA  | ACTIVE        | CDIP         | J                  | 14   | 1              | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>31502BCA    | <a href="#">Samples</a> |
| M38510/31502BDA  | ACTIVE        | CFP          | W                  | 14   | 1              | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>31502BDA    | <a href="#">Samples</a> |
| SN54LS90J        | ACTIVE        | CDIP         | J                  | 14   | 1              | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | SN54LS90J               | <a href="#">Samples</a> |
| SN54LS93J        | ACTIVE        | CDIP         | J                  | 14   | 1              | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | SN54LS93J               | <a href="#">Samples</a> |
| SN74LS90D        | ACTIVE        | SOIC         | D                  | 14   | 50             | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | 0 to 70      | LS90                    | <a href="#">Samples</a> |
| SN74LS90DE4      | ACTIVE        | SOIC         | D                  | 14   | 50             | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | 0 to 70      | LS90                    | <a href="#">Samples</a> |
| SN74LS90DG4      | ACTIVE        | SOIC         | D                  | 14   | 50             | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | 0 to 70      | LS90                    | <a href="#">Samples</a> |
| SN74LS90DR       | ACTIVE        | SOIC         | D                  | 14   | 2500           | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | 0 to 70      | LS90                    | <a href="#">Samples</a> |
| SN74LS90DRG4     | ACTIVE        | SOIC         | D                  | 14   | 2500           | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | 0 to 70      | LS90                    | <a href="#">Samples</a> |
| SN74LS90N        | ACTIVE        | PDIP         | N                  | 14   | 25             | RoHS & Green        | NIPDAU                               | N / A for Pkg Type   | 0 to 70      | SN74LS90N               | <a href="#">Samples</a> |
| SN74LS90NE4      | ACTIVE        | PDIP         | N                  | 14   | 25             | RoHS & Green        | NIPDAU                               | N / A for Pkg Type   | 0 to 70      | SN74LS90N               | <a href="#">Samples</a> |

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)     | Lead finish/<br>Ball material<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|---------------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| SN74LS90NSR      | ACTIVE        | SO           | NS                 | 14   | 2000           | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   |              | 74LS90                  | <a href="#">Samples</a> |
| SN74LS92D        | ACTIVE        | SOIC         | D                  | 14   | 50             | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | 0 to 70      | LS92                    | <a href="#">Samples</a> |
| SN74LS92N        | ACTIVE        | PDIP         | N                  | 14   | 25             | RoHS & Green        | NIPDAU                               | N / A for Pkg Type   | 0 to 70      | SN74LS92N               | <a href="#">Samples</a> |
| SN74LS92NSR      | ACTIVE        | SO           | NS                 | 14   | 2000           | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | 0 to 70      | 74LS92                  | <a href="#">Samples</a> |
| SN74LS93D        | ACTIVE        | SOIC         | D                  | 14   | 50             | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | 0 to 70      | LS93                    | <a href="#">Samples</a> |
| SN74LS93N        | ACTIVE        | PDIP         | N                  | 14   | 25             | RoHS & Green        | NIPDAU                               | N / A for Pkg Type   | 0 to 70      | SN74LS93N               | <a href="#">Samples</a> |
| SNJ54LS90J       | ACTIVE        | CDIP         | J                  | 14   | 1              | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | 7603201CA<br>SNJ54LS90J | <a href="#">Samples</a> |
| SNJ54LS93J       | ACTIVE        | CDIP         | J                  | 14   | 1              | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | 7700101CA<br>SNJ54LS93J | <a href="#">Samples</a> |
| SNJ54LS93W       | ACTIVE        | CFP          | W                  | 14   | 1              | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | 7700101DA<br>SNJ54LS93W | <a href="#">Samples</a> |

(1) 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) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

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

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

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

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

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**OTHER QUALIFIED VERSIONS OF SN54LS90, SN54LS93, SN74LS90, SN74LS93 :**

- Catalog : [SN74LS90](#), [SN74LS93](#)
- Military : [SN54LS90](#), [SN54LS93](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

## TAPE AND REEL INFORMATION



\*All dimensions are nominal

| Device      | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LS90DR  | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| SN74LS90NSR | SO           | NS              | 14   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |
| SN74LS92NSR | SO           | NS              | 14   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device      | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LS90DR  | SOIC         | D               | 14   | 2500 | 853.0       | 449.0      | 35.0        |
| SN74LS90NSR | SO           | NS              | 14   | 2000 | 853.0       | 449.0      | 35.0        |
| SN74LS92NSR | SO           | NS              | 14   | 2000 | 853.0       | 449.0      | 35.0        |

## TUBE



\*All dimensions are nominal

| Device      | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|-------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| SN74LS90D   | D            | SOIC         | 14   | 50  | 506.6  | 8      | 3940   | 4.32   |
| SN74LS90DE4 | D            | SOIC         | 14   | 50  | 506.6  | 8      | 3940   | 4.32   |
| SN74LS90DG4 | D            | SOIC         | 14   | 50  | 506.6  | 8      | 3940   | 4.32   |
| SN74LS90N   | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74LS90N   | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74LS90NE4 | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74LS90NE4 | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74LS92D   | D            | SOIC         | 14   | 50  | 506.6  | 8      | 3940   | 4.32   |
| SN74LS92N   | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74LS92N   | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74LS93D   | D            | SOIC         | 14   | 50  | 506.6  | 8      | 3940   | 4.32   |
| SN74LS93N   | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74LS93N   | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |

# 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.

W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



**J 14**

## GENERIC PACKAGE VIEW

**CDIP - 5.08 mm max height**

CERAMIC DUAL IN LINE PACKAGE



Images above are just a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.

4040083-5/G



**J0014A**

## PACKAGE OUTLINE

**CDIP - 5.08 mm max height**

CERAMIC DUAL IN LINE PACKAGE



### NOTES:

1. All controlling linear dimensions are in inches. Dimensions in brackets are in millimeters. Any dimension in brackets or parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This package is hermetically sealed with a ceramic lid using glass frit.
4. Index point is provided on cap for terminal identification only and on press ceramic glass frit seal only.
5. Falls within MIL-STD-1835 and GDIP1-T14.

# EXAMPLE BOARD LAYOUT

J0014A

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



LAND PATTERN EXAMPLE  
NON-SOLDER MASK DEFINED  
SCALE: 5X



4214771/A 05/2017

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



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

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



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

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.

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