

# SN54390, SN54LS390, SN54393, SN54LS393 SN74390, SN74LS390, SN74393, SN74LS393 DUAL 4-BIT DECADE AND BINARY COUNTERS

SDLS107 - OCTOBER 1976 - REVISED MARCH 1988

- Dual Versions of the Popular '90A, 'LS90 and '93A, 'LS93
- '390, 'LS390 . . . Individual Clocks for A and B Flip-Flops Provide Dual  $\div 2$  and  $\div 5$  Counters
- '393, 'LS393 . . . Dual 4-Bit Binary Counter with Individual Clocks
- All Have Direct Clear for Each 4-Bit Counter
- Dual 4-Bit Versions Can Significantly Improve System Densities by Reducing Counter Package Count by 50%
- Typical Maximum Count Frequency . . . 35 MHz
- Buffered Outputs Reduce Possibility of Collector Commutation

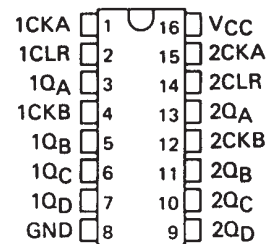
## description

Each of these monolithic circuits contains eight master-slave flip-flops and additional gating to implement two individual four-bit counters in a single package. The '390 and 'LS390 incorporate dual divide-by-two and divide-by-five counters, which can be used to implement cycle lengths equal to any whole and/or cumulative multiples of 2 and/or 5 up to divide-by-100. When connected as a bi-quinary counter, the separate divide-by-two circuit can be used to provide symmetry (a square wave) at the final output stage. The '393 and 'LS393 each comprise two independent four-bit binary counters each having a clear and a clock input. N-bit binary counters can be implemented with each package providing the capability of divide-by-256. The '390, 'LS390, '393, and 'LS393 have parallel outputs from each counter stage so that any submultiple of the input count frequency is available for system-timing signals.

Series 54 and Series 54LS circuits are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ ; Series 74 and Series 74LS circuits are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

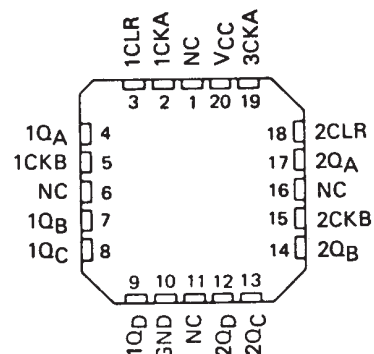
SN54390, SN54LS390 . . . J OR W PACKAGE  
SN74390 . . . N PACKAGE  
SN74LS390 . . . D OR N PACKAGE

(TOP VIEW)



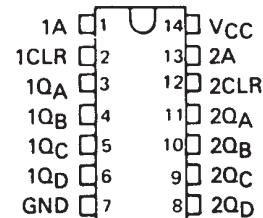
SN54LS390 . . . FK PACKAGE

(TOP VIEW)



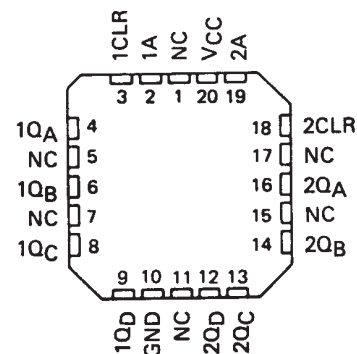
SN54393, SN54LS393 . . . J OR W PACKAGE  
SN74393 . . . N PACKAGE  
SN74LS393 . . . D OR N PACKAGE

(TOP VIEW)



SN54LS393 . . . FK PACKAGE

(TOP VIEW)



NC - No internal connection

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS  
INSTRUMENTS**

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# SN54390, SN54LS390, SN54393, SN54LS393 SN74390, SN74LS390, SN74393, SN74LS393 DUAL 4-BIT DECADE AND BINARY COUNTERS

SDLS107 - OCTOBER 1976 - REVISED MARCH 1988

**'390, 'LS390  
BCD COUNT SEQUENCE  
(EACH COUNTER)  
(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              |

**FUNCTION TABLES  
'390, 'LS390  
BI-QUINARY (5-2)  
(EACH COUNTER)  
(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              |

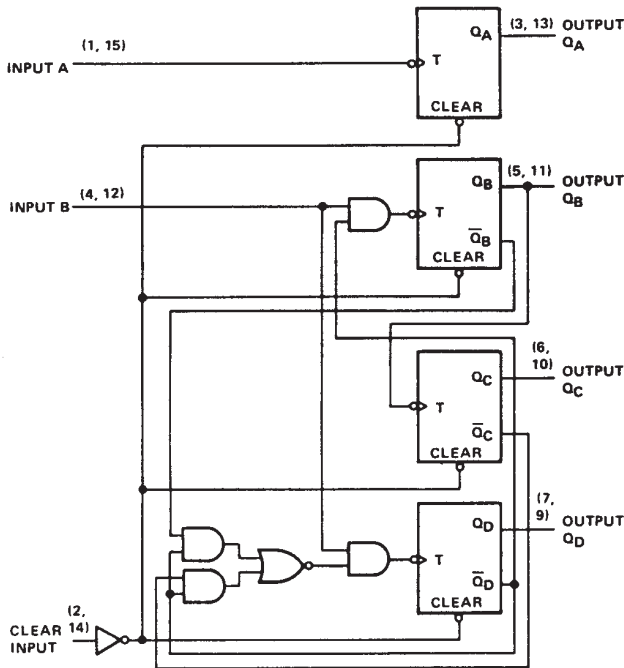
**'393, 'LS393  
COUNT SEQUENCE  
(EACH COUNTER)**

| 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              |

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

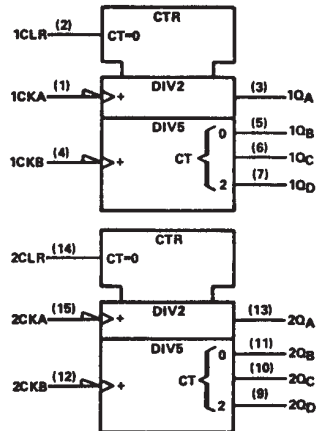
**logic diagrams (positive logic)**

**'390, 'LS390**

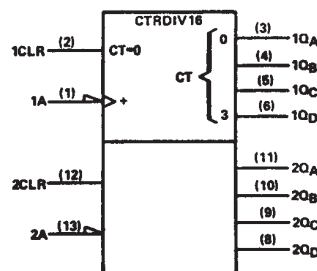


**logic symbols †**

**'390, 'LS390**



**'393, 'LS393**



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

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

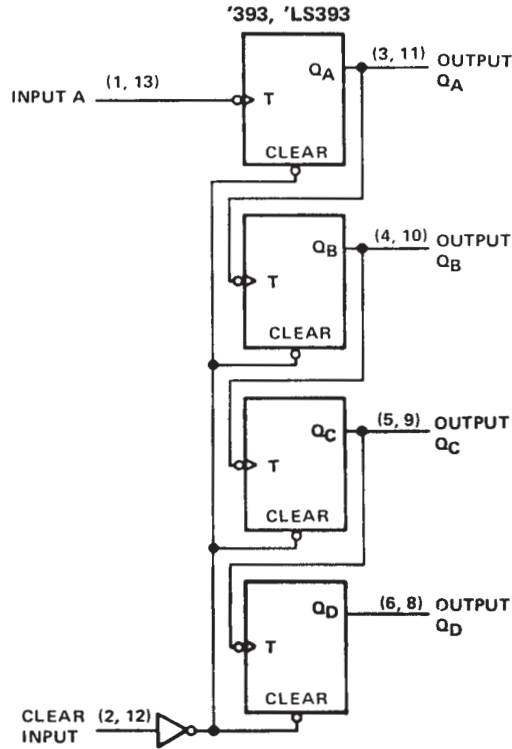


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SN54390, SN54LS390, SN54393, SN54LS393  
 SN74390, SN74LS390, SN74393, SN74LS393  
 DUAL 4-BIT DECADE AND BINARY COUNTERS

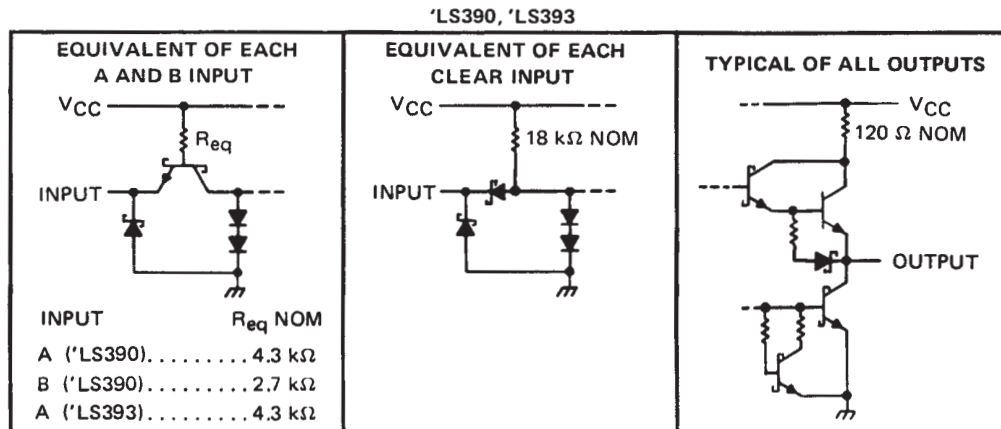
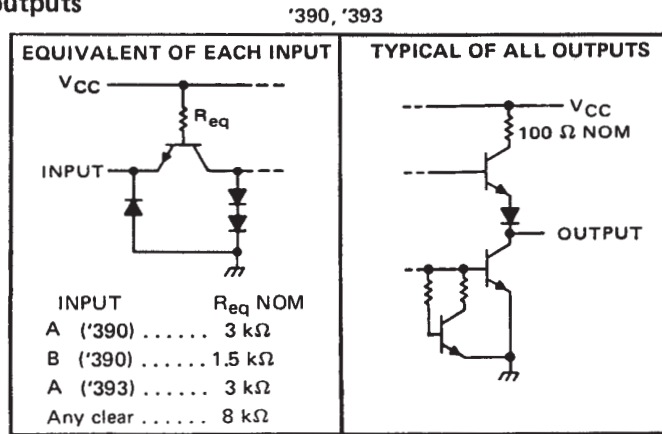
SDLS107 - OCTOBER 1976 - REVISED MARCH 1988

logic diagrams (continued)



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

schematics of inputs and outputs



# SN54390, SN54LS390, SN54393, SN54LS393 SN74390, SN74LS390, SN74393, SN74LS393 DUAL 4-BIT DECADE AND BINARY COUNTERS

SDLS107 – OCTOBER 1976 – REVISED MARCH 1988

## 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          |
| Operating free-air temperature range: SN54390, SN54393 | -55°C to 125°C |
| SN74390, SN74393                                       | 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

|   | SN54390<br>SN54393  |     |      | SN74390<br>SN74393 |     |      | 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, $f_{count}$              | A input             |     | 0    | 25                 | 0   |      | 25      | MHz |
|   | B input             |     | 0    | 20                 | 0   |      | 20      |     |
| Pulse width, $t_w$                        | A input high or low |     | 20   |                    | 20  |      | ns      |     |
|   | B input high or low |     | 25   |                    | 25  |      |         |     |
|   | Clear high          |     | 20   |                    | 20  |      |         |     |
| Clear inactive-state setup time, $t_{SU}$ | 25↓                 |     | 25↓  |                    |     |      | ns      |     |
| Operating free-air temperature, $T_A$     | -55                 |     | 125  |                    | 0   |      | 70      | °C  |

↓ The arrow indicates that the falling edge of the clock pulse is used for reference.

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

| PARAMETER                                    | TEST CONDITIONS†   | '390  |      |     | '393 |      |     | UNIT    |
|--|--|-------|------|-----|------|------|-----|---------|
|  |  | MIN   | TYP‡ | MAX | MIN  | TYP‡ | MAX |         |
| $V_{IH}$ High-level input voltage            |  | 2     |      |     | 2    |      |     | V       |
| $V_{IL}$ Low-level input voltage             |  | 0.8   |      |     | 0.8  |      |     | V       |
| $V_{IK}$ Input clamp voltage                 | $V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$  | -1.5  |      |     | -1.5 |      |     | V       |
| $V_{OH}$ High-level output voltage           | $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{OH} = -800 \mu\text{A}$       | 2.4   | 3.4  |     | 2.4  | 3.4  |     | V       |
| $V_{OL}$ Low-level output voltage            | $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{OL} = 16 \text{ mA} \uparrow$ |       | 0.2  | 0.4 |      | 0.2  | 0.4 | V       |
| $I_I$ Input current at maximum input voltage | $V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$   | 1     |      |     | 1    |      |     | mA      |
| $I_{IH}$ High-level input current            | Clear  | 40    |      |     | 40   |      |     | $\mu$ A |
|  | Input A  | 80    |      |     | 80   |      |     |         |
|  | Input B  | 120   |      |     |      |      |     |         |
| $I_{IL}$ Low-level input current             | Clear  | -1    |      |     | -1   |      |     | mA      |
|  | Input A  | -3.2  |      |     | -3.2 |      |     |         |
|  | Input B  | -4.8  |      |     |      |      |     |         |
| $I_{OS}$ Short-circuit output current §      | $V_{CC} = \text{MAX}$  | SN54' | -20  | -57 | -20  | -57  | mA  |         |
|  |  | SN74' | -18  | -57 | -18  | -57  |     |         |
| $I_{CC}$ Supply current                      | $V_{CC} = \text{MAX}, \text{ See Note 2}$  | 42    | 69   |     | 38   | 64   | mA  |         |

† 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.

¶ The  $Q_A$  outputs of the '390 are tested at  $I_{OL} = 16 \text{ mA}$  plus the limit value for  $I_{IL}$  for the B input. This permits driving the B input while maintaining full fan-out capability.

NOTE 2:  $I_{CC}$  is measured with all outputs open, both clear inputs grounded following momentary connection to 4.5 V, and all other inputs grounded.



SN54390, SN54LS390, SN54393, SN54LS393  
 SN74390, SN74LS390, SN74393, SN74LS393  
 DUAL 4-BIT DECADE AND BINARY COUNTERS

SDLS107 – OCTOBER 1976 – REVISED MARCH 1988

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

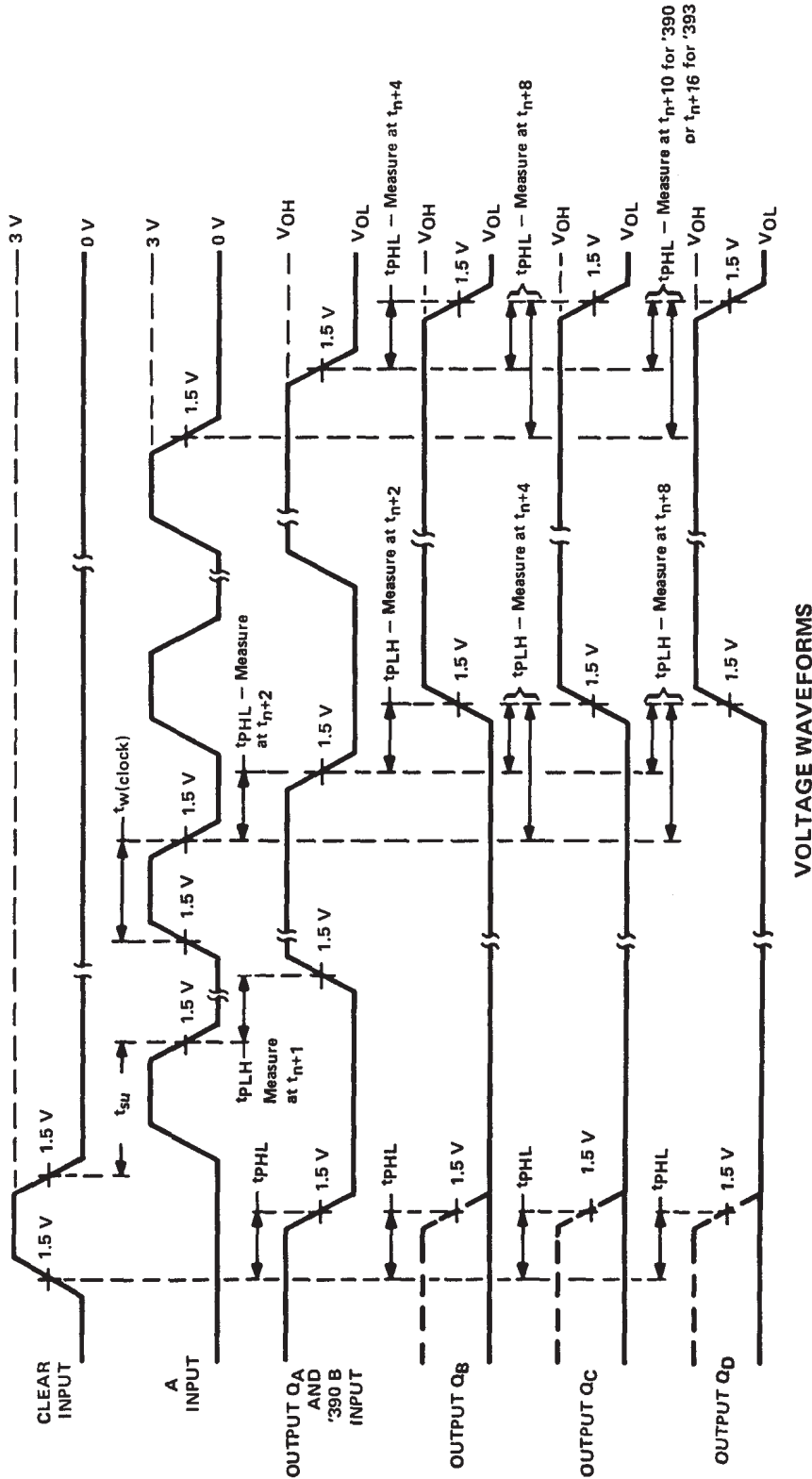
| PARAMETER  | FROM<br>(INPUT) | TO<br>(OUTPUT)                 | TEST CONDITIONS  | '390 |     |     | '393 |     |     | UNIT |
|------------|-----------------|--------------------------------|--|------|-----|-----|------|-----|-----|------|
|            |                 |                                |  | MIN  | TYP | MAX | MIN  | TYP | MAX |      |
| $f_{\max}$ | A               | $Q_A$                          | $C_L = 15\text{ pF}$ ,<br>$R_L = 400\ \Omega$ ,<br>See Note 3<br>and<br>Figure 1 | 25   | 35  |     | 25   | 35  | MHz |      |
|            | B               | $Q_B$                          |  | 20   | 30  |     |      |     |     |      |
| $t_{PLH}$  | A               | $Q_A$                          |  | 12   | 20  |     | 12   | 20  | ns  |      |
| $t_{PHL}$  |                 |                                |  | 13   | 20  |     | 13   | 20  |     |      |
| $t_{PLH}$  | A               | $Q_C$ of '390<br>$Q_D$ of '393 |  | 37   | 60  |     | 40   | 60  | ns  |      |
| $t_{PHL}$  |                 |                                |  | 39   | 60  |     | 40   | 60  |     |      |
| $t_{PLH}$  | B               | $Q_B$                          |  | 13   | 21  |     |      |     | ns  |      |
| $t_{PHL}$  |                 |                                |  | 14   | 21  |     |      |     |     |      |
| $t_{PLH}$  | B               | $Q_C$                          |  | 24   | 39  |     |      |     | ns  |      |
| $t_{PHL}$  |                 |                                |  | 26   | 39  |     |      |     |     |      |
| $t_{PLH}$  | B               | $Q_D$                          |  | 13   | 21  |     |      |     | ns  |      |
| $t_{PHL}$  |                 |                                |  | 14   | 21  |     |      |     |     |      |
| $t_{PHL}$  | Clear           | Any                            |  | 24   | 39  |     | 24   | 39  | ns  |      |

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

SN54390, SN54LS390, SN54393, SN54LS393  
 SN74390, SN74LS390, SN74393, SN74LS393  
 DUAL 4-BIT DECADE AND BINARY COUNTERS

SDLS107 - OCTOBER 1976 - REVISED MARCH 1988

PARAMETER MEASUREMENT INFORMATION



NOTE A: Input pulses are supplied by a generator having the following characteristics  $t_r \leq 5 \text{ ns}$ ,  $t_f \leq 5 \text{ ns}$ ,  $PRR = 1 \text{ MHz}$ , duty cycle = 50%,  $Z_{out} \approx 50 \text{ ohms}$ .

FIGURE 1

# SN54390, SN54LS390, SN54393, SN54LS393 SN74390, SN74LS390, SN74393, SN74LS393 DUAL 4-BIT DECADE AND BINARY COUNTERS

SDLS107 – OCTOBER 1976 – REVISED MARCH 1988

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

|  |                |
|--|----------------|
| Supply voltage, $V_{CC}$ (see Note 1)                      | 7 V            |
| Clear input voltage  | 7 V            |
| Any A or B clock input voltage                             | 5.5 V          |
| Operating free-air temperature range: SN54LS390, SN54LS393 | -55°C to 125°C |
| SN74LS390, SN74LS393                                       | 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

|   | SN54LS390<br>SN54LS393 |     |                 | SN74LS390<br>SN74LS393 |     |      | 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, $f_{count}$              | A input                |     | 0               | 25                     | 0   |      | 25      | MHz |
|   | B input                |     | 0               | 12.5                   | 0   |      | 12.5    |     |
| Pulse width, $t_w$                        | A input high or low    |     | 20              |                        | 20  |      | ns      |     |
|   | B input high or low    |     | 40              |                        | 40  |      |         |     |
|   | Clear high             |     | 20              |                        | 20  |      |         |     |
| Clear inactive-state setup time, $t_{SU}$ | 25 $\downarrow$        |     | 25 $\downarrow$ |                        |     |      | ns      |     |
| Operating free-air temperature, $T_A$     | -55                    |     | 125             |                        | 0   |      | 70      | °C  |

$\downarrow$  The arrow indicates that the falling edge of the clock pulse is used for reference.

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

| PARAMETER  | TEST CONDITIONS <sup>†</sup>  | SN54LS'                                    |                  |                       | SN74LS' |                  |      | UNIT |
|--|---|--|------------------|-----------------------|---------|------------------|------|------|
|  |   | MIN  | TYP <sup>‡</sup> | MAX                   | MIN     | TYP <sup>‡</sup> | MAX  |      |
| $V_{IH}$ High-level input voltage                  |   | 2  |                  |                       | 2       |                  |      | V    |
| $V_{IL}$ Low-level input voltage                   |   | 0.7  |                  |                       | 0.8     |                  |      | V    |
| $V_{IK}$ Input clamp voltage                       | $V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$   | -1.5                                       |                  |                       | -1.5    |                  |      | V    |
| $V_{OH}$ High-level output voltage                 | $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}, I_{OH} = -400 \mu\text{A}$ | 2.5  | 3.4              |                       | 2.7     | 3.4              |      | V    |
| $V_{OL}$ Low-level output voltage                  | $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V},$                                | $I_{OL} = 4 \text{ mA}$ <sup>¶</sup>       |                  | 0.25                  | 0.4     | 0.25             | 0.4  | V    |
|  |   | $I_{OL} = 8 \text{ mA}$ <sup>¶</sup>       |                  |                       |         | 0.35             | 0.5  |      |
| $I_I$ Input current at maximum input voltage       | Clear   | $V_{CC} = \text{MAX}$                      |                  | $V_I = 7 \text{ V}$   |         | 0.1              | 0.1  | mA   |
|  | Input A   |  |                  | $V_I = 5.5 \text{ V}$ |         | 0.2              | 0.2  |      |
|  | Input B   |  |                  |                       |         | 0.4              | 0.4  |      |
| $I_{IH}$ High-level input current                  | Clear   | $V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$ |                  |                       |         | 0.02             | 0.02 | mA   |
|  | Input A   |  |                  |                       |         | 0.1              | 0.1  |      |
|  | Input B   |  |                  |                       |         | 0.2              | 0.2  |      |
| $I_{IL}$ Low-level input current                   | Clear   | $V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$ |                  |                       |         | -0.4             | -0.4 | mA   |
|  | Input A   |  |                  |                       |         | -1.6             | -1.6 |      |
|  | Input B   |  |                  |                       |         | -2.4             | -2.4 |      |
| $I_{OS}$ Short-circuit output current <sup>§</sup> | $V_{CC} = \text{MAX}$   | -20  | -100             | -20                   | -100    |                  |      | mA   |
| $I_{CC}$ Supply current                            | $V_{CC} = \text{MAX},$<br>See Note 2  | 'LS390                                     |                  | 15                    | 26      | 15               | 26   | mA   |
|  |   | 'LS393                                     |                  | 15                    | 26      | 15               | 26   |      |

<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, and duration of the short-circuit should not exceed one second.

<sup>¶</sup> The  $Q_A$  outputs of the 'LS390 are tested at  $I_{OL} = \text{MAX}$  plus the limit value for  $I_{IL}$  for the clock B input. This permits driving the clock B input while maintaining full fan-out capability.

NOTE 2:  $I_{CC}$  is measured with all outputs open, both clear inputs grounded following momentary connection to 4.5 V, and all other inputs grounded.



**SN54390, SN54LS390, SN54393, SN54LS393  
 SN74390, SN74LS390, SN74393, SN74LS393  
 DUAL 4-BIT DECADE AND BINARY COUNTERS**

SDLS107 – OCTOBER 1976 – REVISED MARCH 1988

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

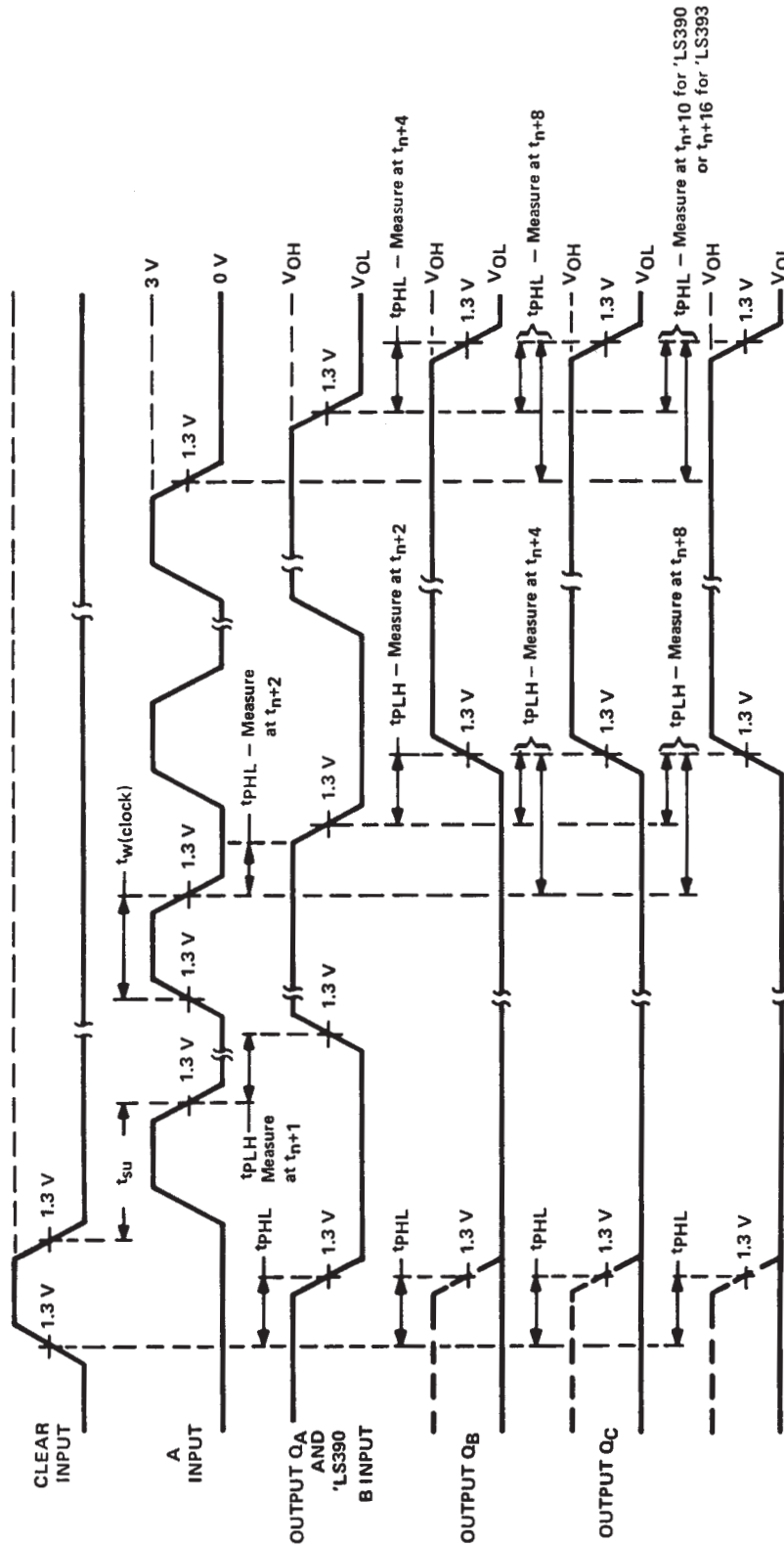
| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT)                     | TEST CONDITIONS   | 'LS390 |     |     | 'LS393 |     |     | UNIT |
|-----------|-----------------|------------------------------------|---|--------|-----|-----|--------|-----|-----|------|
|           |                 |                                    |   | MIN    | TYP | MAX | MIN    | TYP | MAX |      |
| $f_{max}$ | A               | $Q_A$                              | $C_L = 15\text{ pF}$ ,<br>$R_L = 2\text{ k}\Omega$ ,<br>See Note 4 and Figure 2 | 25     | 35  |     | 25     | 35  |     | MHz  |
|           | B               | $Q_B$                              |   | 12.5   | 20  |     |        |     |     |      |
| $t_{PLH}$ | A               | $Q_A$                              |   | 12     | 20  |     | 12     | 20  |     | ns   |
| $t_{PHL}$ |                 |                                    |   | 13     | 20  |     | 13     | 20  |     |      |
| $t_{PLH}$ | A               | $Q_C$ of 'LS390<br>$Q_D$ of 'LS393 |   | 37     | 60  |     | 40     | 60  |     | ns   |
| $t_{PHL}$ |                 |                                    |   | 39     | 60  |     | 40     | 60  |     |      |
| $t_{PLH}$ | B               | $Q_B$                              |   | 13     | 21  |     |        |     |     | ns   |
| $t_{PHL}$ |                 |                                    |   | 14     | 21  |     |        |     |     |      |
| $t_{PLH}$ | B               | $Q_C$                              |   | 24     | 39  |     |        |     |     | ns   |
| $t_{PHL}$ |                 |                                    |   | 26     | 39  |     |        |     |     |      |
| $t_{PLH}$ | B               | $Q_D$                              |   | 13     | 21  |     |        |     |     | ns   |
| $t_{PHL}$ |                 |                                    |   | 14     | 21  |     |        |     |     |      |
| $t_{PHL}$ | Clear           | Any                                |   | 24     | 39  |     | 24     | 39  |     | ns   |

NOTE 4: Load circuits and voltage waveforms are shown in Section 1.





PARAMETER MEASUREMENT INFORMATION



VOLTAGE WAVEFORMS

NOTE A: Input pulses are supplied by a generator having the following characteristics  $t_r \leq 15$  ns,  $t_f \leq 6$  ns, PRR = 1 MHz, duty cycle = 50 %,  $Z_{out} \approx 50$  ohms.

FIGURE 2

**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package Drawing | Pins | Package 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                 |
|------------------|---------------|--------------|-----------------|------|-------------|------------------|--------------------------------------|----------------------|--------------|-------------------------------------|-------------------------|
| 7802601EA        | ACTIVE        | CDIP         | J               | 16   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | 7802601EA<br>SNJ54LS390J            | <a href="#">Samples</a> |
| 7802601FA        | ACTIVE        | CFP          | W               | 16   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | 7802601FA<br>SNJ54LS390W            | <a href="#">Samples</a> |
| 7802601FA        | ACTIVE        | CFP          | W               | 16   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | 7802601FA<br>SNJ54LS390W            | <a href="#">Samples</a> |
| JM38510/32701B2A | ACTIVE        | LCCC         | FK              | 20   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32701B2A                | <a href="#">Samples</a> |
| JM38510/32701B2A | ACTIVE        | LCCC         | FK              | 20   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32701B2A                | <a href="#">Samples</a> |
| JM38510/32701BEA | ACTIVE        | CDIP         | J               | 16   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32701BEA                | <a href="#">Samples</a> |
| JM38510/32701BEA | ACTIVE        | CDIP         | J               | 16   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32701BEA                | <a href="#">Samples</a> |
| JM38510/32702B2A | ACTIVE        | LCCC         | FK              | 20   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32702B2A                | <a href="#">Samples</a> |
| JM38510/32702B2A | ACTIVE        | LCCC         | FK              | 20   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32702B2A                | <a href="#">Samples</a> |
| JM38510/32702BCA | ACTIVE        | CDIP         | J               | 14   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32702BCA                | <a href="#">Samples</a> |
| JM38510/32702BCA | ACTIVE        | CDIP         | J               | 14   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32702BCA                | <a href="#">Samples</a> |
| JM38510/32702BDA | ACTIVE        | CFP          | W               | 14   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32702BDA                | <a href="#">Samples</a> |
| JM38510/32702BDA | ACTIVE        | CFP          | W               | 14   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32702BDA                | <a href="#">Samples</a> |
| JM38510/32702SDA | ACTIVE        | CFP          | W               | 14   | 25          | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32702SDA<br>SNV54LS393W | <a href="#">Samples</a> |
| JM38510/32702SDA | ACTIVE        | CFP          | W               | 14   | 25          | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32702SDA<br>SNV54LS393W | <a href="#">Samples</a> |
| M38510/32701B2A  | ACTIVE        | LCCC         | FK              | 20   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32701B2A                | <a href="#">Samples</a> |

| Orderable Device | Status<br>(1) | Package Type | Package Drawing | Pins | Package 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                 |
|------------------|---------------|--------------|-----------------|------|-------------|------------------|--------------------------------------|----------------------|--------------|-------------------------------------|-------------------------|
| M38510/32701B2A  | ACTIVE        | LCCC         | FK              | 20   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32701B2A                | <a href="#">Samples</a> |
| M38510/32701BEA  | ACTIVE        | CDIP         | J               | 16   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32701BEA                | <a href="#">Samples</a> |
| M38510/32701BEA  | ACTIVE        | CDIP         | J               | 16   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32701BEA                | <a href="#">Samples</a> |
| M38510/32702B2A  | ACTIVE        | LCCC         | FK              | 20   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32702B2A                | <a href="#">Samples</a> |
| M38510/32702B2A  | ACTIVE        | LCCC         | FK              | 20   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32702B2A                | <a href="#">Samples</a> |
| M38510/32702BCA  | ACTIVE        | CDIP         | J               | 14   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32702BCA                | <a href="#">Samples</a> |
| M38510/32702BCA  | ACTIVE        | CDIP         | J               | 14   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32702BCA                | <a href="#">Samples</a> |
| M38510/32702BDA  | ACTIVE        | CFP          | W               | 14   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32702BDA                | <a href="#">Samples</a> |
| M38510/32702BDA  | ACTIVE        | CFP          | W               | 14   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32702BDA                | <a href="#">Samples</a> |
| M38510/32702SDA  | ACTIVE        | CFP          | W               | 14   | 25          | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32702SDA<br>SNV54LS393W | <a href="#">Samples</a> |
| M38510/32702SDA  | ACTIVE        | CFP          | W               | 14   | 25          | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | JM38510/<br>32702SDA<br>SNV54LS393W | <a href="#">Samples</a> |
| SN54LS390J       | ACTIVE        | CDIP         | J               | 16   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | SN54LS390J                          | <a href="#">Samples</a> |
| SN54LS390J       | ACTIVE        | CDIP         | J               | 16   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | SN54LS390J                          | <a href="#">Samples</a> |
| SN54LS393J       | ACTIVE        | CDIP         | J               | 14   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | SN54LS393J                          | <a href="#">Samples</a> |
| SN54LS393J       | ACTIVE        | CDIP         | J               | 14   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | SN54LS393J                          | <a href="#">Samples</a> |
| SN74LS390D       | ACTIVE        | SOIC         | D               | 16   | 40          | RoHS & Green     | NIPDAU                               | Level-1-260C-UNLIM   | 0 to 70      | LS390                               | <a href="#">Samples</a> |
| SN74LS390D       | ACTIVE        | SOIC         | D               | 16   | 40          | RoHS & Green     | NIPDAU                               | Level-1-260C-UNLIM   | 0 to 70      | LS390                               | <a href="#">Samples</a> |

| Orderable Device | Status<br>(1) | Package Type | Package Drawing | Pins | Package 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                 |
|------------------|---------------|--------------|-----------------|------|-------------|---------------------|--------------------------------------|----------------------|--------------|--------------------------|-------------------------|
| SN74LS390N       | ACTIVE        | PDIP         | N               | 16   | 25          | RoHS & Green        | NIPDAU                               | N / A for Pkg Type   | 0 to 70      | SN74LS390N               | <a href="#">Samples</a> |
| SN74LS390N       | ACTIVE        | PDIP         | N               | 16   | 25          | RoHS & Green        | NIPDAU                               | N / A for Pkg Type   | 0 to 70      | SN74LS390N               | <a href="#">Samples</a> |
| SN74LS390NE4     | ACTIVE        | PDIP         | N               | 16   | 25          | RoHS & Green        | NIPDAU                               | N / A for Pkg Type   | 0 to 70      | SN74LS390N               | <a href="#">Samples</a> |
| SN74LS390NE4     | ACTIVE        | PDIP         | N               | 16   | 25          | RoHS & Green        | NIPDAU                               | N / A for Pkg Type   | 0 to 70      | SN74LS390N               | <a href="#">Samples</a> |
| SN74LS390NSR     | ACTIVE        | SO           | NS              | 16   | 2000        | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | 0 to 70      | 74LS390                  | <a href="#">Samples</a> |
| SN74LS390NSR     | ACTIVE        | SO           | NS              | 16   | 2000        | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | 0 to 70      | 74LS390                  | <a href="#">Samples</a> |
| SN74LS393D       | LIFEBUY       | SOIC         | D               | 14   | 50          | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | 0 to 70      | LS393                    |                         |
| SN74LS393D       | LIFEBUY       | SOIC         | D               | 14   | 50          | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | 0 to 70      | LS393                    |                         |
| SN74LS393DR      | ACTIVE        | SOIC         | D               | 14   | 2500        | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | 0 to 70      | LS393                    | <a href="#">Samples</a> |
| SN74LS393DR      | ACTIVE        | SOIC         | D               | 14   | 2500        | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | 0 to 70      | LS393                    | <a href="#">Samples</a> |
| SN74LS393N       | ACTIVE        | PDIP         | N               | 14   | 25          | RoHS & Green        | NIPDAU                               | N / A for Pkg Type   | 0 to 70      | SN74LS393N               | <a href="#">Samples</a> |
| SN74LS393N       | ACTIVE        | PDIP         | N               | 14   | 25          | RoHS & Green        | NIPDAU                               | N / A for Pkg Type   | 0 to 70      | SN74LS393N               | <a href="#">Samples</a> |
| SN74LS393NE4     | ACTIVE        | PDIP         | N               | 14   | 25          | RoHS & Green        | NIPDAU                               | N / A for Pkg Type   | 0 to 70      | SN74LS393N               | <a href="#">Samples</a> |
| SN74LS393NE4     | ACTIVE        | PDIP         | N               | 14   | 25          | RoHS & Green        | NIPDAU                               | N / A for Pkg Type   | 0 to 70      | SN74LS393N               | <a href="#">Samples</a> |
| SN74LS393NSR     | ACTIVE        | SO           | NS              | 14   | 2000        | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | 0 to 70      | 74LS393                  | <a href="#">Samples</a> |
| SN74LS393NSR     | ACTIVE        | SO           | NS              | 14   | 2000        | RoHS & Green        | NIPDAU                               | Level-1-260C-UNLIM   | 0 to 70      | 74LS393                  | <a href="#">Samples</a> |
| SNJ54LS390FK     | ACTIVE        | LCCC         | FK              | 20   | 1           | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | SNJ54LS<br>390FK         | <a href="#">Samples</a> |
| SNJ54LS390FK     | ACTIVE        | LCCC         | FK              | 20   | 1           | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | SNJ54LS<br>390FK         | <a href="#">Samples</a> |
| SNJ54LS390J      | ACTIVE        | CDIP         | J               | 16   | 1           | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | 7802601EA<br>SNJ54LS390J | <a href="#">Samples</a> |
| SNJ54LS390J      | ACTIVE        | CDIP         | J               | 16   | 1           | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | 7802601EA<br>SNJ54LS390J | <a href="#">Samples</a> |
| SNJ54LS390W      | ACTIVE        | CFP          | W               | 16   | 1           | Non-RoHS<br>& Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | 7802601FA<br>SNJ54LS390W | <a href="#">Samples</a> |

| Orderable Device | Status<br>(1) | Package Type | Package Drawing | Pins | Package 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                 |
|------------------|---------------|--------------|-----------------|------|-------------|------------------|--------------------------------------|----------------------|--------------|--------------------------|-------------------------|
| SNJ54LS390W      | ACTIVE        | CFP          | W               | 16   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | 7802601FA<br>SNJ54LS390W | <a href="#">Samples</a> |
| SNJ54LS393FK     | ACTIVE        | LCCC         | FK              | 20   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | SNJ54LS<br>393FK         | <a href="#">Samples</a> |
| SNJ54LS393FK     | ACTIVE        | LCCC         | FK              | 20   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | SNJ54LS<br>393FK         | <a href="#">Samples</a> |
| SNJ54LS393J      | ACTIVE        | CDIP         | J               | 14   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | SNJ54LS393J              | <a href="#">Samples</a> |
| SNJ54LS393J      | ACTIVE        | CDIP         | J               | 14   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | SNJ54LS393J              | <a href="#">Samples</a> |
| SNJ54LS393W      | ACTIVE        | CFP          | W               | 14   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | SNJ54LS393W              | <a href="#">Samples</a> |
| SNJ54LS393W      | ACTIVE        | CFP          | W               | 14   | 1           | Non-RoHS & Green | SNPB                                 | N / A for Pkg Type   | -55 to 125   | SNJ54LS393W              | <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.

(5) 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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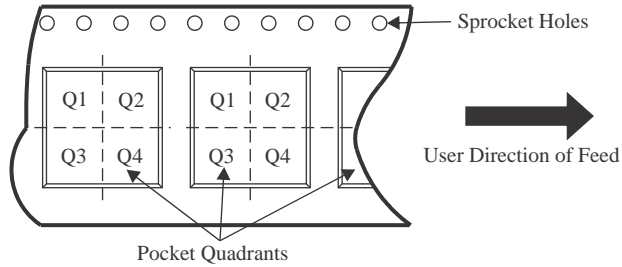
**OTHER QUALIFIED VERSIONS OF SN54LS390, SN54LS393, SN54LS393-SP, SN74LS390, SN74LS393 :**

- Catalog : [SN74LS390](#), [SN74LS393](#), [SN54LS393](#)
  
- Military : [SN54LS390](#), [SN54LS393](#)
  
- Space : [SN54LS393-SP](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
  
- Military - QML certified for Military and Defense Applications
  
- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

**TAPE AND REEL INFORMATION**

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


\*All dimensions are nominal

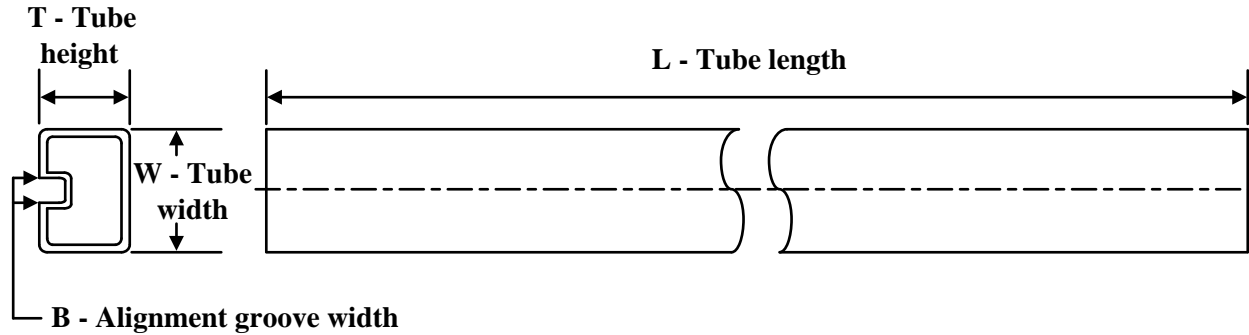
| Device       | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|--------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LS390NSR | SO           | NS              | 16   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |
| SN74LS393DR  | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| SN74LS393NSR | 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) |
|--------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LS390NSR | SO           | NS              | 16   | 2000 | 356.0       | 356.0      | 35.0        |
| SN74LS393DR  | SOIC         | D               | 14   | 2500 | 356.0       | 356.0      | 35.0        |
| SN74LS393NSR | SO           | NS              | 14   | 2000 | 356.0       | 356.0      | 35.0        |



**TUBE**


\*All dimensions are nominal

| Device           | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (µm) | B (mm) |
|------------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| 7802601FA        | W            | CFP          | 16   | 1   | 506.98 | 26.16  | 6220   | NA     |
| JM38510/32701B2A | FK           | LCCC         | 20   | 1   | 506.98 | 12.06  | 2030   | NA     |
| JM38510/32702B2A | FK           | LCCC         | 20   | 1   | 506.98 | 12.06  | 2030   | NA     |
| JM38510/32702BDA | W            | CFP          | 14   | 1   | 506.98 | 26.16  | 6220   | NA     |
| JM38510/32702SDA | W            | CFP          | 14   | 25  | 506.98 | 26.16  | 6220   | NA     |
| M38510/32701B2A  | FK           | LCCC         | 20   | 1   | 506.98 | 12.06  | 2030   | NA     |
| M38510/32702B2A  | FK           | LCCC         | 20   | 1   | 506.98 | 12.06  | 2030   | NA     |
| M38510/32702BDA  | W            | CFP          | 14   | 1   | 506.98 | 26.16  | 6220   | NA     |
| M38510/32702SDA  | W            | CFP          | 14   | 25  | 506.98 | 26.16  | 6220   | NA     |
| SN74LS390D       | D            | SOIC         | 16   | 40  | 507    | 8      | 3940   | 4.32   |
| SN74LS390N       | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74LS390N       | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74LS390NE4     | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74LS390NE4     | N            | PDIP         | 16   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74LS393D       | D            | SOIC         | 14   | 50  | 506.6  | 8      | 3940   | 4.32   |
| SN74LS393N       | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74LS393N       | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74LS393NE4     | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74LS393NE4     | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SNJ54LS390FK     | FK           | LCCC         | 20   | 1   | 506.98 | 12.06  | 2030   | NA     |
| SNJ54LS390W      | W            | CFP          | 16   | 1   | 506.98 | 26.16  | 6220   | NA     |
| SNJ54LS393FK     | FK           | LCCC         | 20   | 1   | 506.98 | 12.06  | 2030   | NA     |
| SNJ54LS393W      | W            | CFP          | 14   | 1   | 506.98 | 26.16  | 6220   | NA     |

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



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

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



4211283-4/E 08/12

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

# 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)

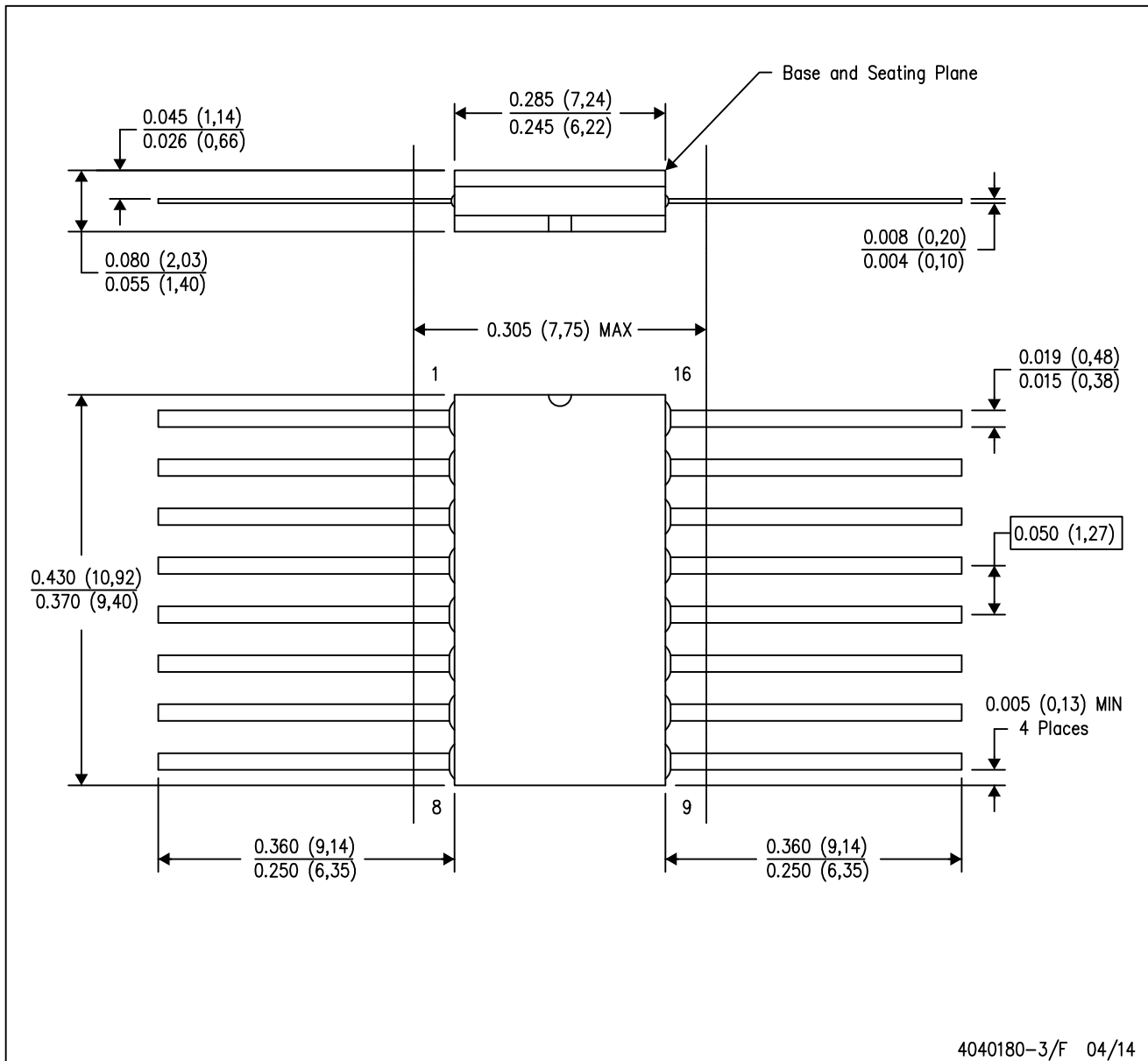
CERAMIC DUAL FLATPACK



- 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-F14

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 GDFP2-F16

## GENERIC PACKAGE VIEW

**FK 20**

**LCCC - 2.03 mm max height**

8.89 x 8.89, 1.27 mm pitch

LEADLESS CERAMIC CHIP CARRIER

This image is a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.



4229370VA\

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



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



4214771/A 05/2017

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



4040047-5/M 06/11

- 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



4211283-3/E 08/12

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

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

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



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.

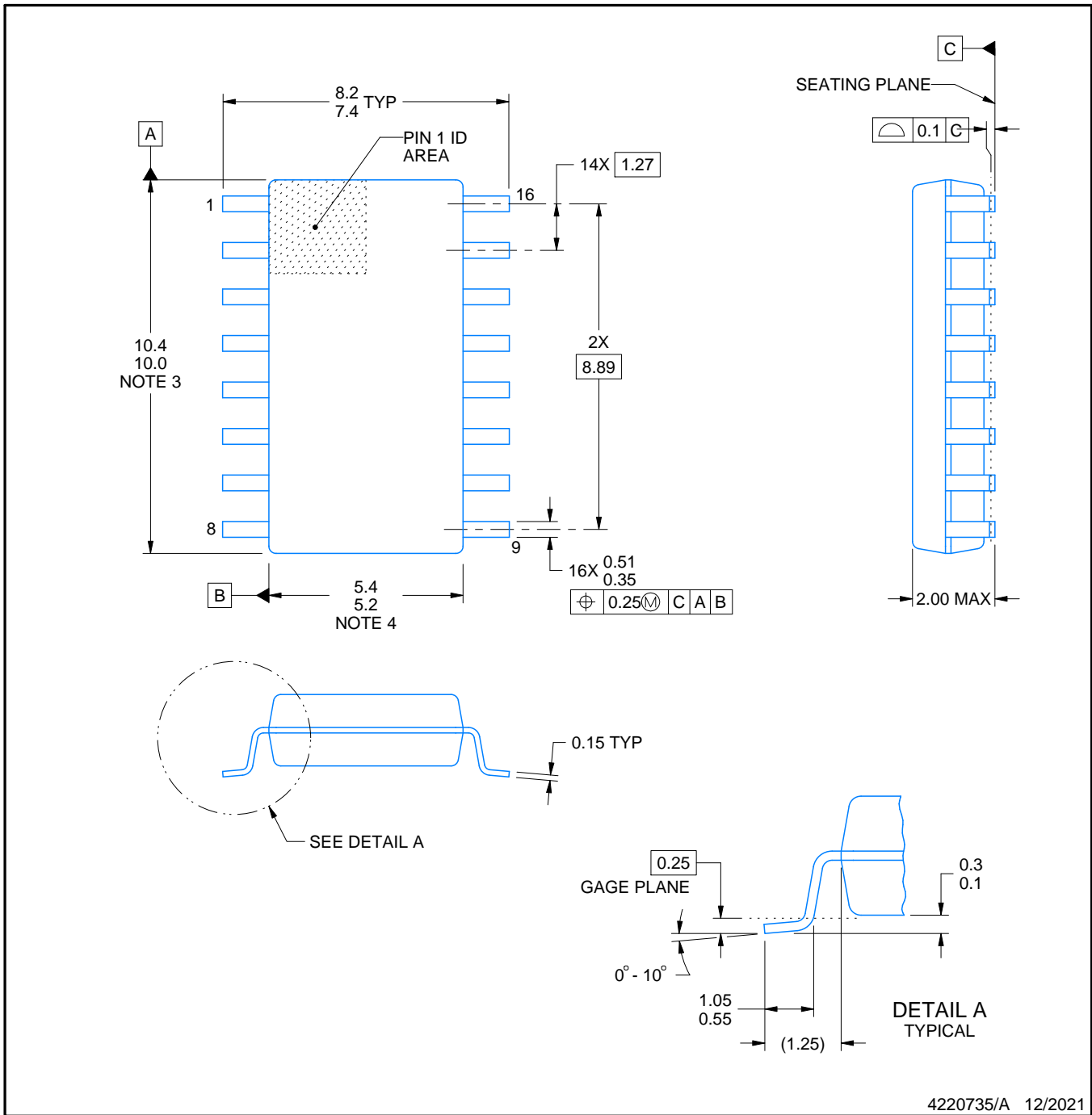


# PACKAGE OUTLINE

## NS0016A

### SOP - 2.00 mm max height

SOP



4220735/A 12/2021

#### NOTES:

1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.

# EXAMPLE BOARD LAYOUT

NS0016A

SOP - 2.00 mm max height

SOP



4220735/A 12/2021

NOTES: (continued)

5. Publication IPC-7351 may have alternate designs.

6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



# EXAMPLE STENCIL DESIGN

NS0016A

SOP - 2.00 mm max height

SOP



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:7X

4220735/A 12/2021

NOTES: (continued)

7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
8. Board assembly site may have different recommendations for stencil design.

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