

# SN54LV393A, SN74LV393A DUAL 4-BIT BINARY COUNTERS

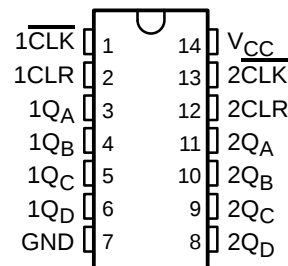
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- 2-V to 5.5-V  $V_{CC}$  Operation
- Max  $t_{pd}$  of 10 ns at 5 V
- Typical  $V_{OLP}$  (Output Ground Bounce)  
<0.8 V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- Typical  $V_{OHV}$  (Output  $V_{OH}$  Undershoot)  
>2.3 V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- $I_{off}$  Supports Partial-Power-Down-Mode Operation
- Dual 4-Bit Binary Counters With Individual Clocks
- Direct Clear for Each 4-Bit Counter
- Can Significantly Improve System Densities by Reducing Counter Package Count by 50 Percent
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

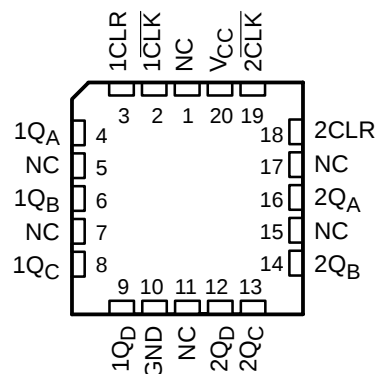
## description/ordering information

The 'LV393A devices contain eight flip-flops and additional gating to implement two individual 4-bit counters in a single package. These devices are designed for 2-V to 5.5-V  $V_{CC}$  operation.

SN54LV393A . . . J OR W PACKAGE  
SN74LV393A . . . D, DB, DGV, NS, OR PW PACKAGE  
(TOP VIEW)



SN54LV393A . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

## ORDERING INFORMATION

| $T_A$          | PACKAGE†    |              | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|-------------|--------------|-----------------------|------------------|
| –40°C to 85°C  | SOIC – D    | Tube of 50   | SN74LV393AD           | LV393A           |
|                |             | Reel of 2500 | SN74LV393ADR          |                  |
|                | SOP – NS    | Reel of 2000 | SN74LV393ANSR         | 74LV393A         |
|                | SSOP – DB   | Reel of 2000 | SN74LV393ADBR         | LV393A           |
|                | TSSOP – PW  | Tube of 90   | SN74LV393APW          | LV393A           |
|                |             | Reel of 2000 | SN74LV393APWR         |                  |
|                |             | Reel of 250  | SN74LV393APWT         |                  |
|                | TVSOP – DGV | Reel of 2000 | SN74LV393ADGVR        | LV393A           |
| –55°C to 125°C | CDIP – J    | Tube of 25   | SNJ54LV393AJ          | SNJ54LV393AJ     |
|                | CFP – W     | Tube of 150  | SNJ54LV393AW          | SNJ54LV393AW     |
|                | LCCC – FK   | Tube of 55   | SNJ54LV393AFK         | SNJ54LV393AFK    |

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).



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UNLESS OTHERWISE NOTED this document contains PRODUCTION DATA information 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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SN54LV393A, SN74LV393A  
DUAL 4-BIT BINARY COUNTERS

SCLS457B – FEBRUARY 2001 – REVISED JULY 2003

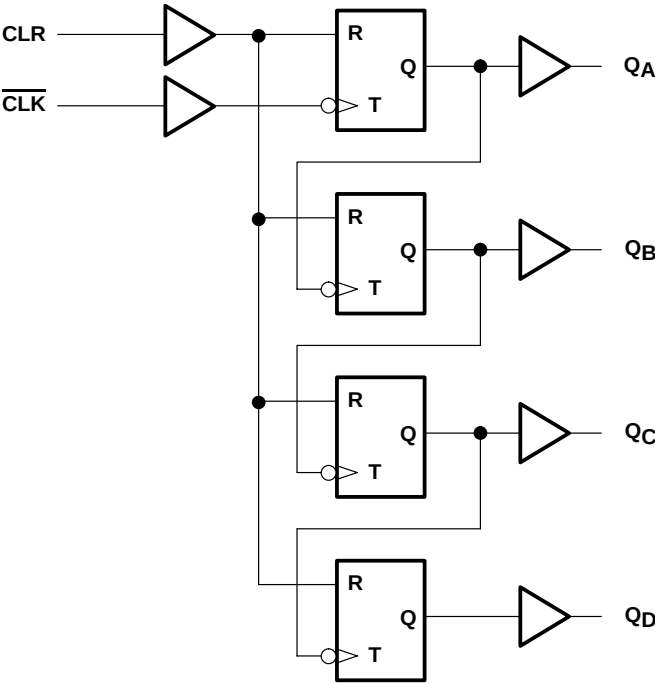
description/ordering informaton (continued)

These devices comprise two independent 4-bit binary counters, each having a clear (CLR) and a clock ( $\overline{\text{CLK}}$ ) input. These devices change state on the negative-going transition of the  $\overline{\text{CLK}}$  pulse. N-bit binary counters can be implemented with each package, providing the capability of divide by 256. The 'LV393A devices have parallel outputs from each counter stage so that any submultiple of the input count frequency is available for system timing signals.

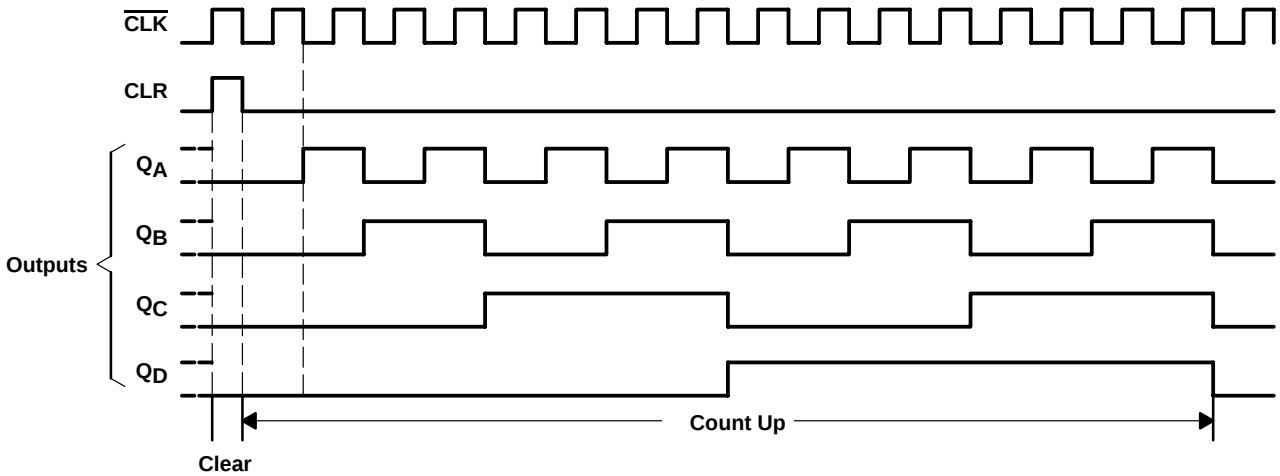
These devices are fully specified for partial-power-down applications using  $\text{I}_{\text{off}}$ . The  $\text{I}_{\text{off}}$  circuitry disables the outputs, preventing damaging current backflow through the devices when they are powered down.

| FUNCTION TABLE |     |                       |
|----------------|-----|-----------------------|
| INPUTS         |     | FUNCTION              |
| CLK            | CLR |                       |
| ↑              | L   | No change             |
| ↓              | L   | Advance to next stage |
| X              | H   | All outputs L         |

logic diagram, each counter (positive logic)



## timing diagram



## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

|                                                                              |                            |
|------------------------------------------------------------------------------|----------------------------|
| Supply voltage range, $V_{CC}$                                               | –0.5 V to 7 V              |
| Input voltage range, $V_I$ (see Note 1)                                      | –0.5 V to 7 V              |
| Output voltage range applied in high or low state, $V_O$ (see Notes 1 and 2) | –0.5 V to $V_{CC} + 0.5$ V |
| Output voltage range applied in power-off state, $V_O$ (see Note 1)          | –0.5 V to 7 V              |
| Input clamp current, $I_{IK}$ ( $V_I < 0$ )                                  | –20 mA                     |
| Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ )               | ±50 mA                     |
| Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )                   | ±25 mA                     |
| Continuous current through $V_{CC}$ or GND                                   | ±50 mA                     |
| Package thermal impedance, $\theta_{JA}$ (see Note 3): D package             | 86°C/W                     |
| DB package                                                                   | 96°C/W                     |
| DGV package                                                                  | 127°C/W                    |
| NS package                                                                   | 76°C/W                     |
| PW package                                                                   | 113°C/W                    |
| Storage temperature range, $T_{stg}$                                         | –65°C to 150°C             |

<sup>†</sup> Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
2. This value is limited to 7 V maximum.  
3. The package thermal impedance is calculated in accordance with JESD 51-7.

# SN54LV393A, SN74LV393A DUAL 4-BIT BINARY COUNTERS

SCLS457B – FEBRUARY 2001 – REVISED JULY 2003

## recommended operating conditions (see Note 4)

|                 |                                    |                                  | SN54LV393A            |                 | SN74LV393A            |                 | UNIT |
|-----------------|------------------------------------|----------------------------------|-----------------------|-----------------|-----------------------|-----------------|------|
|                 |                                    |                                  | MIN                   | MAX             | MIN                   | MAX             |      |
| V <sub>CC</sub> | Supply voltage                     |                                  | 2                     | 5.5             | 2                     | 5.5             | V    |
| V <sub>IH</sub> | High-level input voltage           | V <sub>CC</sub> = 2 V            | 1.5                   |                 | 1.5                   |                 | V    |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V | V <sub>CC</sub> × 0.7 |                 | V <sub>CC</sub> × 0.7 |                 |      |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V   | V <sub>CC</sub> × 0.7 |                 | V <sub>CC</sub> × 0.7 |                 |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V | V <sub>CC</sub> × 0.7 |                 | V <sub>CC</sub> × 0.7 |                 |      |
| V <sub>IL</sub> | Low-level input voltage            | V <sub>CC</sub> = 2 V            | 0.5                   |                 | 0.5                   |                 | V    |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V | V <sub>CC</sub> × 0.3 |                 | V <sub>CC</sub> × 0.3 |                 |      |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V   | V <sub>CC</sub> × 0.3 |                 | V <sub>CC</sub> × 0.3 |                 |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V | V <sub>CC</sub> × 0.3 |                 | V <sub>CC</sub> × 0.3 |                 |      |
| V <sub>I</sub>  | Input voltage                      |                                  | 0                     | 5.5             | 0                     | 5.5             | V    |
| V <sub>O</sub>  | Output voltage                     |                                  | 0                     | V <sub>CC</sub> | 0                     | V <sub>CC</sub> | V    |
| I <sub>OH</sub> | High-level output current          | V <sub>CC</sub> = 2 V            | −50                   |                 | −50                   |                 | μA   |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V | −2                    |                 | −2                    |                 | mA   |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V   | −6                    |                 | −6                    |                 |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V | −12                   |                 | −12                   |                 |      |
| I <sub>OL</sub> | Low-level output current           | V <sub>CC</sub> = 2 V            | 50                    |                 | 50                    |                 | μA   |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V | 2                     |                 | 2                     |                 | mA   |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V   | 6                     |                 | 6                     |                 |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V | 12                    |                 | 12                    |                 |      |
| Δt/Δv           | Input transition rise or fall rate | V <sub>CC</sub> = 2.3 V to 2.7 V | 200                   |                 | 200                   |                 | ns/V |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V   | 100                   |                 | 100                   |                 |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V | 20                    |                 | 20                    |                 |      |
| T <sub>A</sub>  | Operating free-air temperature     |                                  | −55                   | 125             | −40                   | 85              | °C   |

NOTE 4: All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

| PARAMETER        | TEST CONDITIONS                                             | V <sub>CC</sub> | SN54LV393A           |     |     | SN74LV393A           |     |     | UNIT |
|------------------|-------------------------------------------------------------|-----------------|----------------------|-----|-----|----------------------|-----|-----|------|
|                  |                                                             |                 | MIN                  | TYP | MAX | MIN                  | TYP | MAX |      |
| V <sub>OH</sub>  | I <sub>OH</sub> = −50 μA                                    | 2 V to 5.5 V    | V <sub>CC</sub> −0.1 |     |     | V <sub>CC</sub> −0.1 |     |     | V    |
|                  | I <sub>OH</sub> = −2 mA                                     | 2.3 V           | 2                    |     |     | 2                    |     |     |      |
|                  | I <sub>OH</sub> = −6 mA                                     | 3 V             | 2.48                 |     |     | 2.48                 |     |     |      |
|                  | I <sub>OH</sub> = −12 mA                                    | 4.5 V           | 3.8                  |     |     | 3.8                  |     |     |      |
| V <sub>OL</sub>  | I <sub>OL</sub> = 50 μA                                     | 2 V to 5.5 V    | 0.1                  |     |     | 0.1                  |     |     | V    |
|                  | I <sub>OL</sub> = 2 mA                                      | 2.3 V           | 0.4                  |     |     | 0.4                  |     |     |      |
|                  | I <sub>OL</sub> = 6 mA                                      | 3 V             | 0.44                 |     |     | 0.44                 |     |     |      |
|                  | I <sub>OL</sub> = 12 mA                                     | 4.5 V           | 0.55                 |     |     | 0.55                 |     |     |      |
| I <sub>I</sub>   | V <sub>I</sub> = 5.5 V or GND                               | 0 to 5.5 V      | ±1                   |     |     | ±1                   |     |     | μA   |
| I <sub>CC</sub>  | V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0 | 5.5 V           | 20                   |     |     | 20                   |     |     | μA   |
| I <sub>off</sub> | V <sub>I</sub> or V <sub>O</sub> = 0 to 5.5 V               | 0               | 5                    |     |     | 5                    |     |     | μA   |
| C <sub>i</sub>   | V <sub>I</sub> = V <sub>CC</sub> or GND                     | 3.3 V           | 1.8                  |     |     | 1.8                  |     |     | pF   |

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# SN54LV393A, SN74LV393A DUAL 4-BIT BINARY COUNTERS

SCLS457B – FEBRUARY 2001 – REVISED JULY 2003

timing requirements over recommended operating free-air temperature range,  $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$  (unless otherwise noted) (see Figure 1)

|                 |                |                          | T <sub>A</sub> = 25°C |     | SN54LV393A |     | SN74LV393A |     | UNIT |
|-----------------|----------------|--------------------------|-----------------------|-----|------------|-----|------------|-----|------|
|                 |                |                          | MIN                   | MAX | MIN        | MAX | MIN        | MAX |      |
| t <sub>w</sub>  | Pulse duration | CLK high or low          | 5                     |     | 5          |     | 5          |     | ns   |
|                 |                | CLR high                 | 5                     |     | 5          |     | 5          |     |      |
| t <sub>su</sub> | Setup time     | CLR inactive before CLK↓ | 6                     |     | 6          |     | 6          |     | ns   |

timing requirements over recommended operating free-air temperature range,  $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$  (unless otherwise noted) (see Figure 1)

|                 |                |                          | T <sub>A</sub> = 25°C |     | SN54LV393A |     | SN74LV393A |     | UNIT |
|-----------------|----------------|--------------------------|-----------------------|-----|------------|-----|------------|-----|------|
|                 |                |                          | MIN                   | MAX | MIN        | MAX | MIN        | MAX |      |
| t <sub>w</sub>  | Pulse duration | CLK high or low          | 5                     |     | 5          |     | 5          |     | ns   |
|                 |                | CLR high                 | 5                     |     | 5          |     | 5          |     |      |
| t <sub>su</sub> | Setup time     | CLR inactive before CLK↓ | 5                     |     | 5          |     | 5          |     | ns   |

timing requirements over recommended operating free-air temperature range,  $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)

|                 |                |                          | T <sub>A</sub> = 25°C |     | SN54LV393A |     | SN74LV393A |     | UNIT |
|-----------------|----------------|--------------------------|-----------------------|-----|------------|-----|------------|-----|------|
|                 |                |                          | MIN                   | MAX | MIN        | MAX | MIN        | MAX |      |
| t <sub>w</sub>  | Pulse duration | CLK high or low          | 5                     |     | 5          |     | 5          |     | ns   |
|                 |                | CLR high                 | 5                     |     | 5          |     | 5          |     |      |
| t <sub>su</sub> | Setup time     | CLR inactive before CLK↓ | 4                     |     | 4          |     | 4          |     | ns   |

switching characteristics over recommended operating free-air temperature range,  $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$  (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT)            | TO (OUTPUT) | LOAD CAPACITANCE     | $T_A = 25^\circ\text{C}$ |       |     | SN54LV393A |       | SN74LV393A |      | UNIT |
|-----------|-------------------------|-------------|----------------------|--------------------------|-------|-----|------------|-------|------------|------|------|
|           |                         |             |                      | MIN                      | TYP   | MAX | MIN        | MAX   | MIN        | MAX  |      |
| $f_{max}$ |                         |             | $C_L = 15\text{ pF}$ | 50*                      | 90*   |     | 40*        |       | 40         |      | MHz  |
|           |                         |             | $C_L = 50\text{ pF}$ | 30                       | 70    |     | 25         |       | 25         |      |      |
| $t_{pd}$  | $\overline{\text{CLK}}$ | $Q_A$       | $C_L = 15\text{ pF}$ | 7.1*                     | 17.7* |     | 1*         | 20.5* | 1          | 20.5 | ns   |
|           |                         | $Q_B$       |                      | 8.5*                     | 20.3* |     | 1*         | 23.5* | 1          | 23.5 |      |
|           |                         | $Q_C$       |                      | 10*                      | 22.5* |     | 1*         | 26*   | 1          | 26   |      |
|           |                         | $Q_D$       |                      | 11.1*                    | 24.2* |     | 1*         | 28*   | 1          | 28   |      |
| $t_{PHL}$ | CLR                     | $Q_n$       |                      | 6.7*                     | 14.8* |     | 1*         | 17*   | 1          | 17   |      |
| $t_{pd}$  | $\overline{\text{CLK}}$ | $Q_A$       | $C_L = 50\text{ pF}$ | 9.3                      | 21.3  |     | 1          | 24.5  | 1          | 24.5 | ns   |
|           |                         | $Q_B$       |                      | 10.9                     | 23.9  |     | 1          | 27.5  | 1          | 27.5 |      |
|           |                         | $Q_C$       |                      | 12.3                     | 26.1  |     | 1          | 30    | 1          | 30   |      |
|           |                         | $Q_D$       |                      | 13.4                     | 27.8  |     | 1          | 32    | 1          | 32   |      |
| $t_{PHL}$ | CLR                     | $Q_n$       |                      | 9.1                      | 17.4  |     | 1          | 20    | 1          | 20   |      |

\* On products compliant to MIL-PRF-38535, this parameter is not production tested

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# SN54LV393A, SN74LV393A DUAL 4-BIT BINARY COUNTERS

SCLS457B – FEBRUARY 2001 – REVISED JULY 2003

switching characteristics over recommended operation free-air temperature range,  
 $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$  (unless otherwise noted) (see Figure 1)

| PARAMETER  | FROM<br>(INPUT)         | TO<br>(OUTPUT) | LOAD<br>CAPACITANCE  | $T_A = 25^\circ\text{C}$ |       |     | SN54LV393A |       | SN74LV393A |      | UNIT |
|------------|-------------------------|----------------|----------------------|--------------------------|-------|-----|------------|-------|------------|------|------|
|            |                         |                |                      | MIN                      | TYP   | MAX | MIN        | MAX   | MIN        | MAX  |      |
| $f_{\max}$ |                         |                | $C_L = 15\text{ pF}$ | 75*                      | 130*  |     | 65*        |       | 65         |      | MHz  |
|            |                         |                | $C_L = 50\text{ pF}$ | 45                       | 105   |     | 35         |       | 35         |      |      |
| $t_{pd}$   | $\overline{\text{CLK}}$ | $Q_A$          | $C_L = 15\text{ pF}$ | 5.1*                     | 13.2* |     | 1*         | 15.5* | 1          | 15.5 | ns   |
|            |                         | $Q_B$          |                      | 6*                       | 15.8* |     | 1*         | 18.5* | 1          | 18.5 |      |
|            |                         | $Q_C$          |                      | 7*                       | 18*   |     | 1*         | 21*   | 1          | 21   |      |
|            |                         | $Q_D$          |                      | 7.7*                     | 19.7* |     | 1*         | 23*   | 1          | 23   |      |
| $t_{PHL}$  | CLR                     | $Q_n$          |                      | 5.1*                     | 12.3* |     | 1*         | 14.5* | 1          | 14.5 |      |
| $t_{pd}$   | $\overline{\text{CLK}}$ | $Q_A$          | $C_L = 50\text{ pF}$ | 6.7                      | 16.7  |     | 1          | 19    | 1          | 19   | ns   |
|            |                         | $Q_B$          |                      | 7.8                      | 19.3  |     | 1          | 22    | 1          | 22   |      |
|            |                         | $Q_C$          |                      | 8.7                      | 21.5  |     | 1          | 24.5  | 1          | 24.5 |      |
|            |                         | $Q_D$          |                      | 9.5                      | 23.2  |     | 1          | 26.5  | 1          | 26.5 |      |
| $t_{PHL}$  | CLR                     | $Q_n$          |                      | 6.8                      | 15.8  |     | 1          | 18    | 1          | 18   |      |

\* On products compliant to MIL-PRF-38535, this parameter is not production tested.

switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)

| PARAMETER  | FROM<br>(INPUT)         | TO<br>(OUTPUT) | LOAD<br>CAPACITANCE  | $T_A = 25^\circ\text{C}$ |       |     | SN54LV393A |       | SN74LV393A |      | UNIT |
|------------|-------------------------|----------------|----------------------|--------------------------|-------|-----|------------|-------|------------|------|------|
|            |                         |                |                      | MIN                      | TYP   | MAX | MIN        | MAX   | MIN        | MAX  |      |
| $f_{\max}$ |                         |                | $C_L = 15\text{ pF}$ | 125*                     | 185*  |     | 105*       |       | 105        |      | MHz  |
|            |                         |                | $C_L = 50\text{ pF}$ | 85                       | 150   |     | 75         |       | 75         |      |      |
| $t_{pd}$   | $\overline{\text{CLK}}$ | $Q_A$          | $C_L = 15\text{ pF}$ | 3.7*                     | 8.5*  |     | 1*         | 10*   | 1          | 10   | ns   |
|            |                         | $Q_B$          |                      | 4.3*                     | 9.8*  |     | 1*         | 11.5* | 1          | 11.5 |      |
|            |                         | $Q_C$          |                      | 4.9*                     | 11.2* |     | 1*         | 13*   | 1          | 13   |      |
|            |                         | $Q_D$          |                      | 5.3*                     | 12.5* |     | 1*         | 14.5* | 1          | 14.5 |      |
| $t_{PHL}$  | CLR                     | $Q_n$          |                      | 3.9*                     | 8.1*  |     | 1*         | 9.5*  | 1          | 9.5  |      |
| $t_{pd}$   | $\overline{\text{CLK}}$ | $Q_A$          | $C_L = 50\text{ pF}$ | 4.9                      | 10.5  |     | 1          | 12    | 1          | 12   | ns   |
|            |                         | $Q_B$          |                      | 5.6                      | 11.8  |     | 1          | 13.5  | 1          | 13.5 |      |
|            |                         | $Q_C$          |                      | 6.2                      | 13.2  |     | 1          | 15    | 1          | 15   |      |
|            |                         | $Q_D$          |                      | 6.6                      | 14.5  |     | 1          | 16.5  | 1          | 16.5 |      |
| $t_{PHL}$  | CLR                     | $Q_n$          |                      | 5.2                      | 10.1  |     | 1          | 11.5  | 1          | 11.5 |      |

\* On products compliant to MIL-PRF-38535, this parameter is not production tested.

noise characteristics,  $V_{CC} = 3.3\text{ V}$ ,  $C_L = 50\text{ pF}$ ,  $T_A = 25^\circ\text{C}$  (see Note 5)

| PARAMETER                                          | SN74LV393A |      |      | UNIT |
|----------------------------------------------------|------------|------|------|------|
|                                                    | MIN        | TYP  | MAX  |      |
| $V_{OL(P)}$ Quiet output, maximum dynamic $V_{OL}$ |            | 0.3  | 0.8  | V    |
| $V_{OL(V)}$ Quiet output, minimum dynamic $V_{OL}$ |            | –0.2 | –0.8 | V    |
| $V_{OH(V)}$ Quiet output, minimum dynamic $V_{OH}$ |            | 2.8  |      | V    |
| $V_{IH(D)}$ High-level dynamic input voltage       | 2.31       |      |      | V    |
| $V_{IL(D)}$ Low-level dynamic input voltage        |            | 0.99 |      | V    |

NOTE 5: Characteristics are for surface-mount packages only.

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# SN54LV393A, SN74LV393A DUAL 4-BIT BINARY COUNTERS

SCLS457B – FEBRUARY 2001 – REVISED JULY 2003

operating characteristics,  $T_A = 25^\circ\text{C}$

| PARAMETER                              | TEST CONDITIONS                               | $V_{CC}$ | TYP  | UNIT |
|----------------------------------------|-----------------------------------------------|----------|------|------|
| $C_{pd}$ Power dissipation capacitance | $C_L = 50\text{ pF}, \quad f = 10\text{ MHz}$ | 3.3 V    | 15.2 | pF   |
|                                        |                                               | 5 V      | 17.3 |      |

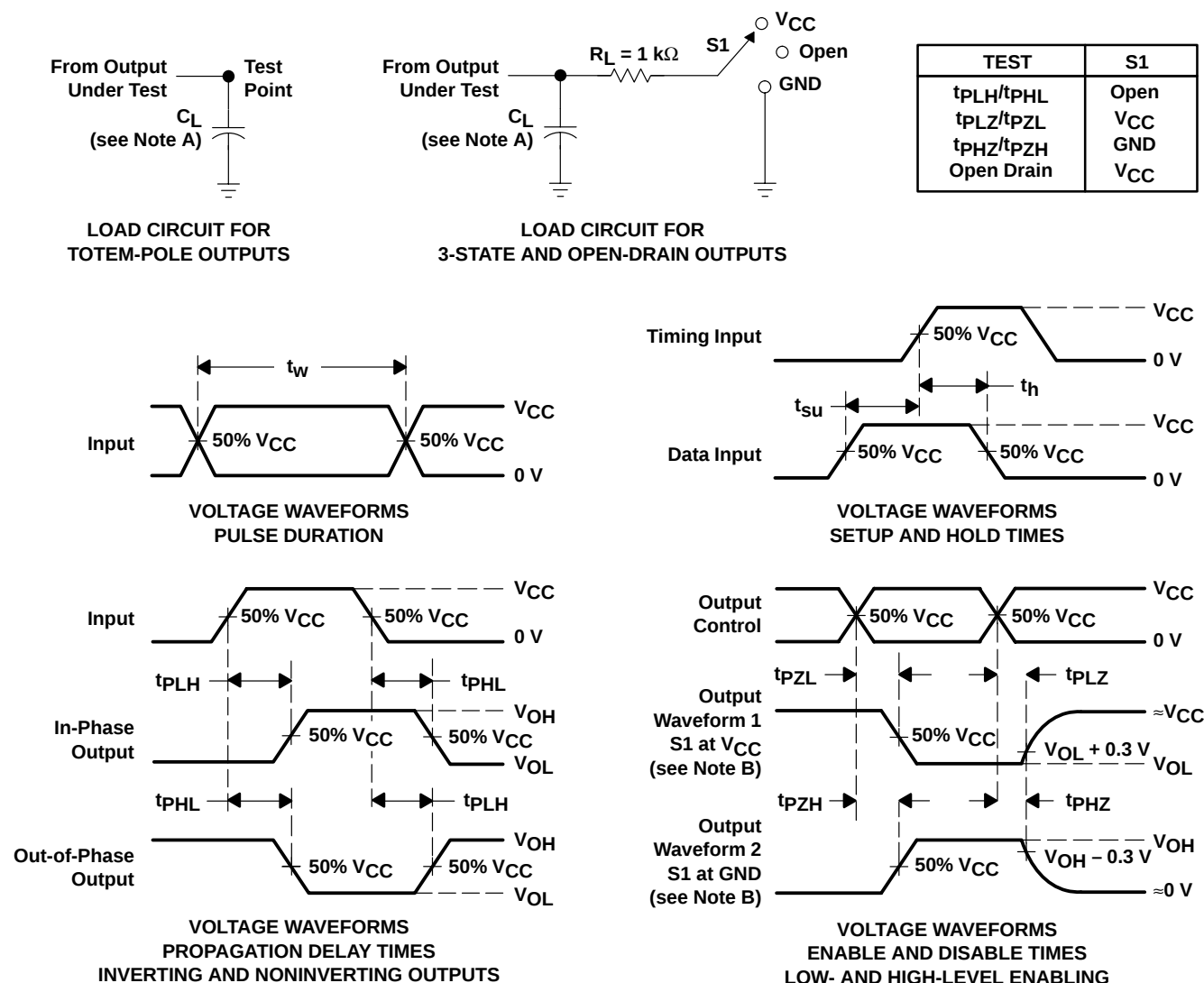


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# SN54LV393A, SN74LV393A DUAL 4-BIT BINARY COUNTERS

SCLS457B – FEBRUARY 2001 – REVISED JULY 2003

## PARAMETER MEASUREMENT INFORMATION



- NOTES:
- $C_L$  includes probe and jig capacitance.
  - Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
  - All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r \leq 3\text{ ns}$ ,  $t_f \leq 3\text{ ns}$ .
  - The outputs are measured one at a time with one input transition per measurement.
  - $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - $t_{PHL}$  and  $t_{PLH}$  are the same as  $t_{pd}$ .
  - All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

## DGV (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE

24 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 per side.  
 D. Falls within JEDEC: 24/48 Pins – MO-153  
 14/16/20/56 Pins – MO-194

## D (R-PDSO-G14)

## PLASTIC SMALL-OUTLINE PACKAGE



4040047-3/F 07/2004

# MECHANICAL DATA

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

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



| DIM \ PINS ** | 14    | 16    | 20    | 24    |
|---------------|-------|-------|-------|-------|
| A MAX         | 10,50 | 10,50 | 12,90 | 15,30 |
| A MIN         | 9,90  | 9,90  | 12,30 | 14,70 |

4040062/C 03/03

- 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.

## DB (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE

28 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.  
 D. Falls within JEDEC MO-150

## PW (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.  
 D. Falls within JEDEC MO-153

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