

# SN54LS183, SN74LS183 DUAL CARRY-SAVE FULL ADDERS

SDLS137

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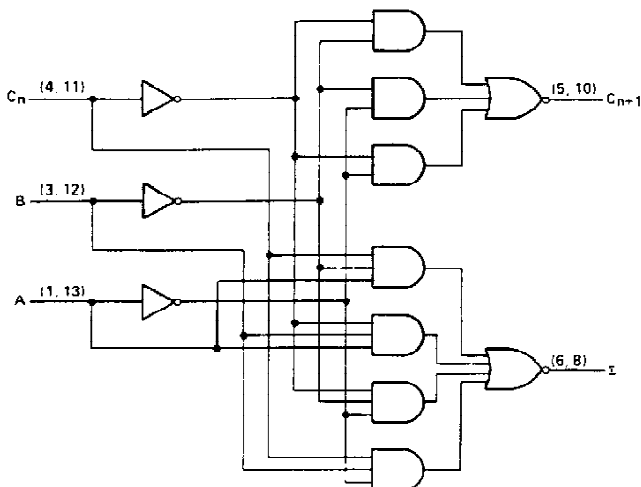
- For Use in High-Speed Wallace-Tree Summing Networks
- High-Speed, High-Fan-Out Darlington Outputs
- Input Clamping Diodes Simplify System Design

| TYPES  | TYPICAL AVERAGE PROPAGATION DELAY TIME | TYPICAL POWER DISSIPATION |
|--------|--|---------------------------|
| 'LS183 | 15 ns                                  | 23 mW per bit             |

## description

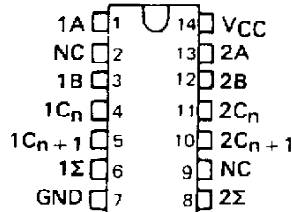
These dual full adders feature an individual carry output from each bit for use in multiple-input, carry-save techniques to produce the true sum and true carry outputs with no more than two gate delays. The circuits utilize high-speed, high-fan-out, transistor-transistor logic (TTL), but are compatible with both DTL and TTL families. SN54LS183 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ ; SN74LS183 is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

## logic diagram (each adder)

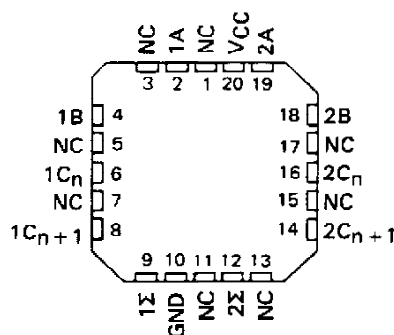


Pin numbers shown are for D, J, N, and W packages.

SN54LS183 . . . J OR W PACKAGE  
SN74LS183 . . . D OR N PACKAGE  
(TOP VIEW)



SN54LS183 . . . FK PACKAGE  
(TOP VIEW)



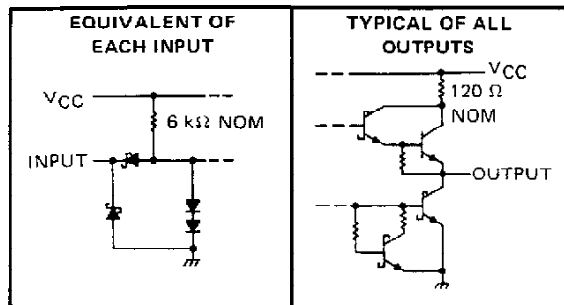
NC - No internal connection

FUNCTION TABLE  
(EACH ADDER)

| INPUTS |   |   | OUTPUTS  |           |
|--------|---|---|----------|-----------|
| $C_n$  | B | A | $\Sigma$ | $C_{n+1}$ |
| L      | L | L | L        | L         |
| L      | L | H | H        | L         |
| L      | H | L | H        | L         |
| L      | H | H | L        | H         |
| H      | L | L | H        | L         |
| H      | L | H | L        | H         |
| H      | H | L | L        | H         |
| H      | H | H | H        | H         |

H = high level, L = low level

## schematics of inputs and outputs



PRODUCTION DATA documents contain 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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# SN54LS183, SN74LS183 DUAL CARRY-SAVE FULL ADDERS

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

|  |                |
|--|----------------|
| Supply voltage $V_{CC}$ (see Note 1)                     | 7 V            |
| Input voltage  | 7 V            |
| Operating free-air temperature range: SN54LS183 Circuits | -55°C to 125°C |
| SN74LS183 Circuits                                       | 0°C to 70°C    |
| Storage temperature range                                | -65°C to 150°C |

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

recommended operating conditions

|                                       | SN54LS183 |     |      | SN74LS183 |     |      | 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      |
| Operating free-air temperature, $T_A$ | -55       |     | 125  | 0         |     | 70   | °C      |

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

| PARAMETER                                    | TEST CONDITIONS†  | SN54LS183 |      |      | SN74LS183 |      |      | UNIT    |
|--|---|-----------|------|------|-----------|------|------|---------|
|  |   | MIN       | TYP‡ | MAX  | MIN       | TYP‡ | 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            | $V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}, I_{OL} = 4 \text{ mA}$     |           | 0.25 | 0.4  |           | 0.25 | 0.4  | V       |
|  | $I_{OL} = 8 \text{ mA}$   |           |      |      |           | 0.35 | 0.5  |         |
| $I_I$ Input current at maximum input voltage | $V_{CC} = \text{MAX}, V_I = 7 \text{ V}$  |           |      | 0.3  |           |      | 0.3  | mA      |
| $I_{IH}$ High-level input current            | $V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$  |           |      | 60   |           |      | 60   | $\mu$ A |
| $I_{IL}$ Low-level input current             | $V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$  |           |      | -1.2 |           |      | -1.2 | mA      |
| $I_{OS}$ Short-circuit output current§       | $V_{CC} = \text{MAX}$   | -20       |      | -100 | -20       |      | -100 | mA      |
| $I_{CCL}$ Supply current, all outputs low    | $V_{CC} = \text{MAX},$ See Note 3   |           | 10   | 17   |           | 10   | 17   | mA      |
| $I_{CCH}$ Supply current, all outputs high   | $V_{CC} = \text{MAX},$ See Note 4   |           | 8    | 14   |           | 8    | 14   | mA      |

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

‡ 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.

NOTES: 3.  $I_{CCL}$  is measured with all outputs open and all inputs grounded.

4.  $I_{CCH}$  is measured with all outputs open and all inputs at 4.5 V.

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

| PARAMETER  | TEST CONDITIONS                                 | MIN | TYP | MAX | UNIT |
|--|---|-----|-----|-----|------|
| $t_{PLH}$ Propagation delay time, low-to-high-level output | $C_L = 15 \text{ pF}, R_L = 2 \text{ k}\Omega,$ |     | 9   | 15  | ns   |
| $t_{PHL}$ Propagation delay time, high-to-low-level output | See Note 5                                      |     | 20  | 33  | ns   |

NOTE 5: Load circuits and voltage waveforms are shown in Section 1.



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