

**MOTOROLA**

**DESCRIPTION** — The SN54LS/74LS182 is a high-speed Carry Lookahead Generator. It is generally used with the SN54LS/74LS181 4-Bit Arithmetic Logic Unit to provide high speed lookahead over word lengths of more than four bits. The carry lookahead generator is fully compatible with all members of the Motorola TTL Family.

- PROVIDES CARRY LOOKAHEAD ACROSS A GROUP OF FOUR ALUs
- MULTI-LEVEL LOOKAHEAD FOR HIGH-SPEED ARITHMETIC OPERATION OVER LONG WORD LENGTHS
- INPUT CLAMP DIODES LIMIT HIGH-SPEED TERMINATION EFFECTS

**SN54LS182**  
**SN74LS182**

**CARRY LOOKAHEAD  
GENERATOR**

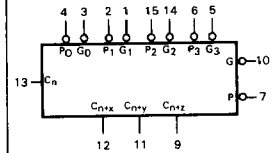
**LOW POWER SCHOTTKY**

**PIN NAMES**

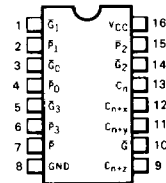
|                             |                                              |
|-----------------------------|----------------------------------------------|
| $C_n$                       | Carry Input                                  |
| $\bar{G}_0, \bar{G}_2$      | Carry Generate (Active LOW) Inputs           |
| $\bar{G}_1$                 | Carry Generate (Active LOW) Input            |
| $\bar{G}_3$                 | Carry Generate (Active LOW) Input            |
| $\bar{P}_0, \bar{P}_1$      | Carry Propagate (Active LOW) Inputs          |
| $\bar{P}_2$                 | Carry Propagate (Active LOW) Input           |
| $\bar{P}_3$                 | Carry Propagate (Active LOW) Input           |
| $C_{n+x}, C_{n+y}, C_{n+z}$ | Carry Outputs (Note b)                       |
| $\bar{G}$                   | Carry Generate (Active LOW) Output (Note b)  |
| $\bar{P}$                   | Carry Propagate (Active LOW) Output (Note b) |

**LOADING (Note a)**

| HIGH     | LOW          |
|----------|--------------|
| 0.5 U.L. | 0.25 U.L.    |
| 3.5 U.L. | 1.75 U.L.    |
| 4.0 U.L. | 2.0 U.L.     |
| 2.0 U.L. | 1.0 U.L.     |
| 2.0 U.L. | 1.0 U.L.     |
| 1.5 U.L. | 0.75 U.L.    |
| 1.0 U.L. | 0.5 U.L.     |
| 10 U.L.  | 5 (2.5) U.L. |
| 10 U.L.  | 5 (2.5) U.L. |
| 10 U.L.  | 5 (2.5) U.L. |

**LOGIC SYMBOL**

$V_{CC}$  = Pin 16  
 $GND$  = Pin 8

**CONNECTION DIAGRAM  
DIP (TOP VIEW)**

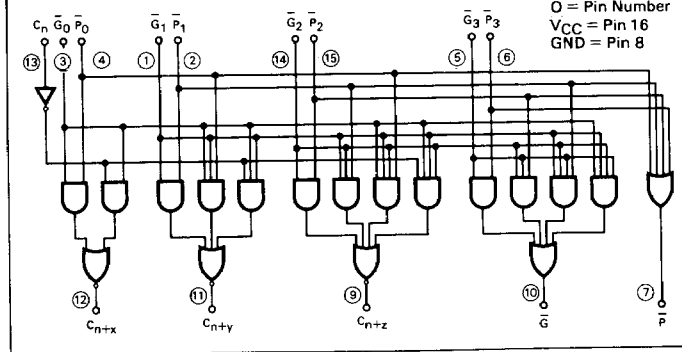
J Suffix — Case 620-08 (Ceramic)  
N Suffix — Case 648-05 (Plastic)

**NOTE:**

The Flatpak version has the same pinouts (Connection Diagram) as the Dual In-Line Package.

**NOTES:**

- a. 1 Unit Load (U.L.) = 40  $\mu$ A HIGH/1.6 mA LOW  
b. The Output LOW drive factor is 2.5 U.L. for Military (54) and 5 U.L. for Commercial (74) Temperature Ranges.

**LOGIC DIAGRAM**

**FUNCTIONAL DESCRIPTION** — The SN54LS/74LS182, carry lookahead generator accepts up to four pairs of active LOW Carry Propagate ( $\overline{P}_0, \overline{P}_1, \overline{P}_2, \overline{P}_3$ ) and Carry Generate ( $\overline{G}_0, \overline{G}_1, \overline{G}_2, \overline{G}_3$ ) signals and an active HIGH Carry Input ( $C_n$ ) and provides anticipated active HIGH carries ( $C_{n+x}, C_{n+y}, C_{n+z}$ ) across four groups of binary adders. The SN54LS/74LS182 also has active LOW Carry Propagate ( $\overline{P}$ ) and Carry Generate ( $\overline{G}$ ) outputs which may be used for further levels of lookahead.

The logic equations provided at the outputs are:

$$C_{n+x} = G_0 + P_0 C_n$$

$$C_{n+y} = G_1 + P_1 G_0 + P_1 P_0 C_n$$

$$C_{n+z} = G_2 + P_2 G_1 + P_2 P_2 G_0 + P_2 P_1 P_0 C_n$$

$$\overline{G} = \overline{G}_3 + \overline{P}_3 \overline{G}_2 + \overline{P}_3 \overline{P}_2 \overline{G}_1 + \overline{P}_3 \overline{P}_2 \overline{P}_1 \overline{G}_0$$

$$\overline{P} = \overline{P}_3 \overline{P}_2 \overline{P}_1 \overline{P}_0$$

Also, the SN54LS/74LS182 can be used with binary ALUs in an active LOW or active HIGH input operand mode. The connections to and from the ALU to the carry lookahead generator are identical in both cases.

TRUTH TABLE

| INPUTS |                  |                  |                  |                  |                  |                  |                  |                  | OUTPUTS   |           |           |                |                |
|--------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-----------|-----------|-----------|----------------|----------------|
| $C_n$  | $\overline{G}_0$ | $\overline{P}_0$ | $\overline{G}_1$ | $\overline{P}_1$ | $\overline{G}_2$ | $\overline{P}_2$ | $\overline{G}_3$ | $\overline{P}_3$ | $C_{n+x}$ | $C_{n+y}$ | $C_{n+z}$ | $\overline{G}$ | $\overline{P}$ |
| X      | H                | H                |                  |                  |                  |                  |                  |                  | L         |           |           |                |                |
| L      | H                | X                |                  |                  |                  |                  |                  |                  | L         |           |           |                |                |
| X      | L                | X                |                  |                  |                  |                  |                  |                  | H         |           |           |                |                |
| H      | X                | L                |                  |                  |                  |                  |                  |                  | H         |           |           |                |                |
| X      | X                | X                | H                | H                |                  |                  |                  |                  |           | L         |           |                |                |
| X      | H                | H                | H                | X                |                  |                  |                  |                  |           | L         |           |                |                |
| L      | H                | X                | H                | X                |                  |                  |                  |                  |           | L         |           |                |                |
| X      | X                | X                | L                | X                |                  |                  |                  |                  |           | H         |           |                |                |
| X      | L                | X                | X                | L                |                  |                  |                  |                  |           | H         |           |                |                |
| H      | X                | L                | X                | L                |                  |                  |                  |                  |           | H         |           |                |                |
| X      | X                | X                | X                | X                | H                | H                |                  |                  |           |           | L         |                |                |
| X      | X                | X                | X                | H                | H                | X                |                  |                  |           |           | L         |                |                |
| X      | H                | H                | H                | X                | H                | X                |                  |                  |           |           | L         |                |                |
| L      | H                | X                | H                | X                | H                | X                |                  |                  |           |           | L         |                |                |
| X      | X                | X                | X                | X                | L                | X                |                  |                  |           |           | H         |                |                |
| X      | X                | X                | L                | X                | X                | L                |                  |                  |           |           | H         |                |                |
| X      | L                | X                | X                | L                | X                | L                |                  |                  |           |           | H         |                |                |
| H      | X                | L                | X                | L                | X                | L                |                  |                  |           |           | H         |                |                |
| X      |                  |                  | X                | X                | X                | X                | H                | H                |           |           |           | H              |                |
| X      |                  |                  | X                | X                | H                | H                | H                | X                |           |           |           | H              |                |
| X      |                  |                  | H                | H                | H                | X                | H                | X                |           |           |           | H              |                |
| H      |                  |                  | H                | X                | H                | X                | H                | X                |           |           |           | H              |                |
| X      |                  |                  | X                | X                | X                | X                | L                | X                |           |           |           | L              |                |
| X      |                  |                  | X                | X                | L                | X                | X                | L                |           |           |           | L              |                |
| X      |                  |                  | L                | X                | X                | L                | X                | L                |           |           |           | L              |                |
| L      |                  |                  | X                | L                | X                | L                | X                | L                |           |           |           | L              |                |
|        | H                |                  |                  | X                |                  | X                |                  | X                |           |           |           |                | H              |
|        | X                |                  |                  | H                |                  | X                |                  | X                |           |           |           |                | H              |
|        | X                |                  |                  | X                |                  | H                |                  | X                |           |           |           |                | H              |
|        | X                |                  |                  | X                |                  | X                |                  | H                |           |           |           |                | H              |
|        | L                |                  |                  | L                |                  | L                |                  | L                |           |           |           |                | L              |

H = HIGH Voltage Level  
L = LOW Voltage Level  
X = Immaterial

## GUARANTEED OPERATING RANGES

| SYMBOL          | PARAMETER                           |          | MIN         | TYP        | MAX         | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V <sub>CC</sub> | Supply Voltage                      | 54<br>74 | 4.5<br>4.75 | 5.0<br>5.0 | 5.5<br>5.25 | V    |
| T <sub>A</sub>  | Operating Ambient Temperature Range | 54<br>74 | -55<br>0    | 25<br>25   | 125<br>70   | °C   |
| I <sub>OH</sub> | Output Current — High               | 54, 74   |             |            | -0.4        | mA   |
| I <sub>OL</sub> | Output Current — Low                | 54<br>74 |             |            | 4.0<br>8.0  | mA   |

## DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL          | PARAMETER                                                                                                                                                   | LIMITS       |              |                                              | UNITS | TEST CONDITIONS                                                                                                                                  |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|----------------------------------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------|
|                 |                                                                                                                                                             | MIN          | TYP          | MAX                                          |       |                                                                                                                                                  |
| V <sub>IH</sub> | Input HIGH Voltage                                                                                                                                          | 2.0          |              |                                              | V     | Guaranteed Input HIGH Voltage for All Inputs                                                                                                     |
| V <sub>IL</sub> | Input LOW Voltage                                                                                                                                           | 54<br>74     |              | 0.7<br>0.8                                   | V     | Guaranteed Input LOW Voltage for All Inputs                                                                                                      |
| V <sub>IK</sub> | Input Clamp Diode Voltage                                                                                                                                   |              | -0.65        | -1.5                                         | V     | V <sub>CC</sub> = MIN I <sub>IN</sub> = -18 mA                                                                                                   |
| V <sub>OH</sub> | Output HIGH Voltage                                                                                                                                         | 54<br>74     | 2.5<br>2.7   |                                              | V     | I <sub>OH</sub> = MAX V <sub>CC</sub> = MIN, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> per Truth Table                                |
| V <sub>OL</sub> | Output LOW Voltage                                                                                                                                          | 54, 74<br>74 | 0.25<br>0.35 | 0.4<br>0.5                                   | V     | I <sub>OL</sub> = 4.0 mA<br>I <sub>OL</sub> = 8.0 mA V <sub>CC</sub> = MIN, V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> per Truth Table |
| I <sub>IH</sub> | C <sub>N</sub><br>G <sub>0</sub> , G <sub>2</sub><br>G <sub>3</sub> , P <sub>0</sub> , P <sub>1</sub><br>P <sub>2</sub><br>P <sub>3</sub><br>G <sub>1</sub> |              |              | 20<br>140<br>80<br>60<br>40<br>160           | μA    | V <sub>IN</sub> = 2.7 V<br>V <sub>CC</sub> = MAX                                                                                                 |
|                 | C <sub>N</sub><br>G <sub>0</sub> , G <sub>2</sub><br>G <sub>3</sub> , P <sub>0</sub> , P <sub>1</sub><br>P <sub>2</sub><br>P <sub>3</sub><br>G <sub>1</sub> |              |              | 0.1<br>0.7<br>0.4<br>0.3<br>0.2<br>0.8       | mA    | V <sub>IN</sub> = 7.0 V<br>V <sub>CC</sub> = MAX                                                                                                 |
| I <sub>IL</sub> | C <sub>N</sub><br>G <sub>0</sub> , G <sub>2</sub><br>G <sub>3</sub> , P <sub>0</sub> , P <sub>1</sub><br>P <sub>2</sub><br>P <sub>3</sub><br>G <sub>1</sub> |              |              | -0.4<br>-2.8<br>-1.6<br>-1.2<br>-0.8<br>-3.2 | mA    | V <sub>IN</sub> = 0.4 V<br>V <sub>CC</sub> = MAX                                                                                                 |
| I <sub>OS</sub> | Output Short-Circuit Current                                                                                                                                | -20          |              | -100                                         | mA    | V <sub>CC</sub> = MAX<br>V <sub>OUT</sub> = 0 V                                                                                                  |
| I <sub>CC</sub> | Power Supply Current<br>Total, Output HIGH                                                                                                                  |              |              | 12                                           | mA    | V <sub>CC</sub> = MAX                                                                                                                            |
|                 | Total, Output LOW                                                                                                                                           |              |              | 16                                           |       |                                                                                                                                                  |

**AC CHARACTERISTICS:**  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = 5.0\text{ V}$ ,  $C_L = 15\text{ pF}$

| SYMBOL                 | PARAMETER                                                                             | LIMITS |           |          | UNITS | TEST CONDITIONS                                                                                                             |
|------------------------|---------------------------------------------------------------------------------------|--------|-----------|----------|-------|-----------------------------------------------------------------------------------------------------------------------------|
|                        |                                                                                       | MIN    | TYP       | MAX      |       |                                                                                                                             |
| $t_{PLH}$<br>$t_{PHL}$ | $(C_n \text{ to } C_{n+x}, C_{n+y}, C_{n+z})$                                         |        | 12<br>17  | 25<br>30 | ns    | $\bar{P}_0 = \bar{P}_1 = \bar{P}_2 = \bar{G}_{nd}$ , $\bar{G}_0 = \bar{G}_1 = \bar{G}_2 = 4.5\text{ V}$ , Fig. 1            |
| $t_{PLH}$<br>$t_{PHL}$ | $(\bar{P}_0, \bar{P}_1, \text{ or } \bar{P}_2 \text{ to } C_{n+x}, C_{n+y}, C_{n+z})$ |        | 9.0<br>10 | 21<br>22 | ns    | $\bar{P}_x = \text{Gnd}$ (if not under test), $C_n = \bar{G}_0 = \bar{G}_1 = \bar{G}_2 = 4.5\text{ V}$ , Fig. 2             |
| $t_{PLH}$<br>$t_{PHL}$ | $(\bar{G}_0, \bar{G}_1, \text{ or } \bar{G}_2 \text{ to } C_{n+x}, C_{n+y}, C_{n+z})$ |        | 9.0<br>10 | 21<br>22 | ns    | $\bar{G}_x = 4.5\text{ V}$ (if not under test), $C_n = \bar{P}_0 = \bar{P}_1 = \bar{P}_2 = \text{Gnd}$ , Fig. 2             |
| $t_{PLH}$<br>$t_{PHL}$ | $(\bar{P}_1, \bar{P}_2 \text{ or } \bar{P}_3 \text{ to } \bar{G})$                    |        | 12<br>8.0 | 24<br>20 | ns    | $\bar{P}_x = \text{Gnd}$ (if not under test), $\bar{G}_0 = \bar{G}_1 = \bar{G}_2 = \bar{G}_3 = C_n = 0.0\text{ V}$ , Fig. 1 |
| $t_{PLH}$<br>$t_{PHL}$ | $(\bar{G}_0, \bar{G}_1, \bar{G}_2 \text{ or } \bar{G}_3 \text{ to } \bar{G})$         |        | 13<br>8.0 | 25<br>20 | ns    | $\bar{G}_x = 4.5\text{ V}$ (if not under test), $\bar{P}_1 = \bar{P}_2 = \bar{P}_3 = \text{Gnd}$ , Fig. 1                   |
| $t_{PLH}$<br>$t_{PHL}$ | $(\bar{P}_0, \bar{P}_1, \bar{P}_2 \text{ or } \bar{P}_3 \text{ to } \bar{P})$         |        | 12<br>8.0 | 24<br>20 | ns    | $\bar{P}_x = \text{Gnd}$ (if not under test), Fig. 1                                                                        |

### AC WAVEFORMS

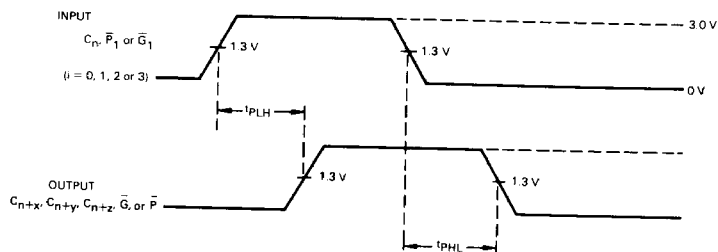


Fig. 1

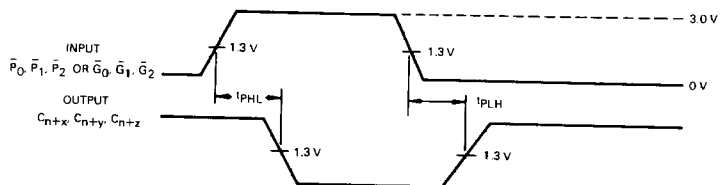


Fig. 2