

# NL17SG373

## Low-Power D-Type Transparent Latch with 3-State Output

The NL17SG373 MiniGate™ is an advanced high-speed CMOS D-Type Transparent Latch with 3-State Output in ultra-small footprint.

The NL17SG373 input structures provide protection when voltages up to 5.5 V are applied, regardless of the supply voltage.

This device is fully specified for partial power-down applications using  $I_{OFF}$ . The  $I_{OFF}$  circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

### Features

- Wide Operating  $V_{CC}$  Range: 0.9 V to 3.6 V
- High Speed:  $t_{PD} = 2.4$  ns (Typ) @  $V_{CC} = 3.0$  V,  $C_L = 15$  pF
- Low Power Dissipation:  $I_{CC} = 0.5$   $\mu$ A (Max) at  $T_A = 25^\circ\text{C}$
- 5.5 V Overvoltage Tolerant (OVT) Input Pins
- Ultra-Small Packages
- These Devices are Pb-Free and are RoHS Compliant

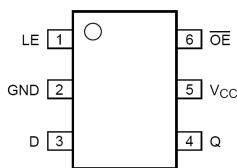


Figure 1. SC88 (Top View)

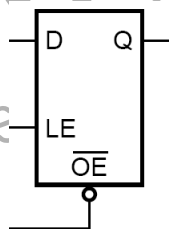


Figure 2. Logic Symbol



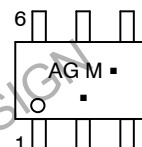
ON Semiconductor®

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### MARKING DIAGRAMS



SC-88  
DF SUFFIX  
CASE 419B



AG = Device Code  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or position may vary depending upon manufacturing location.

### PIN ASSIGNMENT

| Pin | Function        |
|-----|-----------------|
| 1   | LE              |
| 2   | GND             |
| 3   | D               |
| 4   | Q               |
| 5   | $V_{CC}$        |
| 6   | $\overline{OE}$ |

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 9 of this data sheet.

## FUNCTION TABLE

| Input           |    |   | Internal Latch | Output | Operating Mode                    |
|-----------------|----|---|----------------|--------|-----------------------------------|
| $\overline{OE}$ | LE | D |                | Q      |                                   |
| L               | H  | L | L              | L      | Enable and Read Register          |
| L               | H  | H | H              | H      | (Transparent Mode)                |
| L               | L  | X | L              | L      | Latch and Read Register           |
| L               | L  | X | H              | H      |                                   |
| H               | X  | X | X              | Z      | Latch Register and Disable Output |

## MAXIMUM RATINGS

| Symbol        | Parameter                                                                | Value                  | Unit |
|---------------|--------------------------------------------------------------------------|------------------------|------|
| $V_{CC}$      | DC Supply Voltage                                                        | -0.5 to +5.5           | V    |
| $V_{IN}$      | DC Input Voltage                                                         | -0.5 to +5.5           | V    |
| $V_{OUT}$     | DC Output Voltage                                                        | -0.5 to $V_{CC} + 0.5$ | V    |
| $I_{IK}$      | DC Input Diode Current $V_{IN} < GND$                                    | 50                     | mA   |
| $I_{OK}$      | DC Output Diode Current $V_{OUT} < GND, V_{OUT} > V_{CC}$                | ±50                    | mA   |
| $I_O$         | DC Output Source/Sink Current                                            | ±20                    | mA   |
| $I_{CC}$      | DC Supply Current Per Supply Pin                                         | ±50                    | mA   |
| $I_{GND}$     | DC Ground Current per Ground Pin                                         | ±50                    | mA   |
| $T_{STG}$     | Storage Temperature Range                                                | -65 to +150            | °C   |
| $T_L$         | Lead Temperature, 1 mm from Case for 10 Seconds                          | 260                    | °C   |
| $T_J$         | Junction Temperature Under Bias                                          | 150                    | °C   |
| MSL           | Moisture Sensitivity                                                     | Level 1                |      |
| $F_R$         | Flammability Rating Oxygen Index: 28 to 34                               | UL 94 V-0 @ 0.125 in   |      |
| $V_{ESD}$     | ESD Withstand Voltage Human Body Mode (Note 2)<br>Machine Model (Note 3) | > 3000<br>> 200        | V    |
| $I_{LATCHUP}$ | Latchup Performance Above $V_{CC}$ and Below GND at 125°C (Note 4)       | ±100                   | mA   |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Measured with minimum pad spacing on an FR4 board, using 10 mm-by-1 inch, 2 ounce copper trace no air flow.
2. Tested to EIA / JESD22-A114-A.
3. Tested to EIA / JESD22-A115-A.
4. Tested to EIA / JESD78.

## RECOMMENDED OPERATING CONDITIONS

| Symbol                | Parameter                                                     | Min | Max      | Unit |
|-----------------------|---------------------------------------------------------------|-----|----------|------|
| $V_{CC}$              | Positive DC Supply Voltage                                    | 0.9 | 3.6      | V    |
| $V_{IN}$              | Digital Input Voltage                                         | 0   | 3.6      | V    |
| $V_{OUT}$             | Output Voltage Active Mode                                    | 0   | $V_{CC}$ | V    |
| $T_A$                 | Operating Free-Air Temperature                                | -55 | +125     | °C   |
| $\Delta t / \Delta V$ | Input Transition Rise or Fall Rate $V_{CC} = 3.3 V \pm 0.3 V$ | 0   | 10       | nS/V |

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

DC ELECTRICAL CHARACTERISTICS

| Symbol          | Parameter                      | Conditions                                                                              | V <sub>CC</sub> (V)       | T <sub>A</sub> = 25°C  |                        |                        | T <sub>A</sub> = -55°C to +125°C |                        | Unit |
|-----------------|--------------------------------|-----------------------------------------------------------------------------------------|---------------------------|------------------------|------------------------|------------------------|----------------------------------|------------------------|------|
|                 |                                |                                                                                         |                           | Min                    | Typ                    | Max                    | Min                              | Max                    |      |
| V <sub>IH</sub> | High-Level Input Voltage       |                                                                                         | 0.9                       | V <sub>CC</sub>        |                        |                        | V <sub>CC</sub>                  |                        | V    |
|                 |                                |                                                                                         | 1.1 to 1.3                | 0.7 x V <sub>CC</sub>  |                        |                        | 0.7 x V <sub>CC</sub>            |                        |      |
|                 |                                |                                                                                         | 1.4 to 1.6                | 0.65 x V <sub>CC</sub> |                        |                        | 0.65 x V <sub>CC</sub>           |                        |      |
|                 |                                |                                                                                         | 1.65 to 1.95              | 0.65 x V <sub>CC</sub> |                        |                        | 0.65 x V <sub>CC</sub>           |                        |      |
|                 |                                |                                                                                         | 2.3 to 2.7                | 1.7                    |                        |                        | 1.7                              |                        |      |
|                 |                                |                                                                                         | 3.0 to 3.6                | 2.0                    |                        |                        | 2.0                              |                        |      |
| V <sub>IL</sub> | Low-Level Input Voltage        |                                                                                         | 0.9                       |                        |                        | GND                    |                                  | GND                    | V    |
|                 |                                |                                                                                         | 1.1 to 1.3                |                        |                        | 0.3 x V <sub>CC</sub>  |                                  | 0.3 x V <sub>CC</sub>  |      |
|                 |                                |                                                                                         | 1.4 to 1.6                |                        |                        | 0.35 x V <sub>CC</sub> |                                  | 0.35 x V <sub>CC</sub> |      |
|                 |                                |                                                                                         | 1.65 to 1.95              |                        |                        | 0.35 x V <sub>CC</sub> |                                  | 0.35 x V <sub>CC</sub> |      |
|                 |                                |                                                                                         | 2.3 to 2.7                |                        |                        | 0.7                    |                                  | 0.7                    |      |
|                 |                                |                                                                                         | 3.0 to 3.6                |                        |                        | 0.8                    |                                  | 0.8                    |      |
| V <sub>OH</sub> | High-Level Output Voltage      | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                    | I <sub>OH</sub> = -20 µA  | 0.9                    | 0.75                   |                        | 0.75                             |                        | V    |
|                 |                                |                                                                                         | I <sub>OH</sub> = -0.3 mA | 1.1 to 1.3             | 0.75 x V <sub>CC</sub> |                        | 0.75 x V <sub>CC</sub>           |                        |      |
|                 |                                |                                                                                         | I <sub>OH</sub> = -1.7 mA | 1.4 to 1.6             | 0.75 x V <sub>CC</sub> |                        | 0.75 x V <sub>CC</sub>           |                        |      |
|                 |                                |                                                                                         | I <sub>OH</sub> = -3.0 mA | 1.65 to 1.95           | V <sub>CC</sub> - 0.45 |                        | V <sub>CC</sub> - 0.45           |                        |      |
|                 |                                |                                                                                         | I <sub>OH</sub> = -4.0 mA | 2.3 to 2.7             | 2.0                    |                        | 2.0                              |                        |      |
|                 |                                |                                                                                         | I <sub>OH</sub> = -8.0 mA | 3.0 to 3.6             | 2.48                   |                        | 2.48                             |                        |      |
| V <sub>OL</sub> | Low-Level Output Voltage       | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                    | I <sub>OL</sub> = 20 µA   | 0.9                    |                        | 0.1                    |                                  | 0.1                    | V    |
|                 |                                |                                                                                         | I <sub>OL</sub> = 0.3 mA  | 1.1 to 1.3             |                        | 0.25 x V <sub>CC</sub> |                                  | 0.25 x V <sub>CC</sub> |      |
|                 |                                |                                                                                         | I <sub>OL</sub> = 1.7 mA  | 1.4 to 1.6             |                        | 0.25 x V <sub>CC</sub> |                                  | 0.25 x V <sub>CC</sub> |      |
|                 |                                |                                                                                         | I <sub>OL</sub> = 3.0 mA  | 1.65 to 1.95           |                        | 0.45                   |                                  | 0.45                   |      |
|                 |                                |                                                                                         | I <sub>OL</sub> = 4.0 mA  | 2.3 to 2.7             |                        | 0.4                    |                                  | 0.4                    |      |
|                 |                                |                                                                                         | I <sub>OL</sub> = 8.0 mA  | 3.0 to 3.6             |                        | 0.4                    |                                  | 0.4                    |      |
| I <sub>IN</sub> | Input Leakage Current          | 0 ≤ V <sub>IN</sub> ≤ 3.6 V                                                             | 0 to 3.6                  |                        |                        | ±0.1                   |                                  | ±0.5                   | µA   |
| I <sub>CC</sub> | Quiescent Supply Current       | V <sub>IN</sub> = V <sub>CC</sub> or GND                                                | 3.6                       |                        |                        | 0.5                    |                                  | 10                     | µA   |
| I <sub>OZ</sub> | 3-State Output Leakage Current | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> ;<br>V <sub>OUT</sub> = 0 to 3.6 V | 0.9 to 3.6                |                        |                        | 0.1                    |                                  | 1                      | µA   |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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## AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3.0$ ns)

| Symbol                   | Parameter                     | Test Condition                         | $V_{CC}$ (V) | $T_A = 25^\circ\text{C}$ |      |      | $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ |      | Unit |
|--------------------------|-------------------------------|----------------------------------------|--------------|--------------------------|------|------|--------------------------------------------------|------|------|
|                          |                               |                                        |              | Min                      | Typ  | Max  | Min                                              | Max  |      |
| $t_{PLH}$ ,<br>$t_{PHL}$ | Propagation Delay,<br>D to Q  | $C_L = 10$ pF,<br>$R_L = 1$ M $\Omega$ | 0.9          | –                        | 15.3 | –    | –                                                | –    | ns   |
|                          |                               |                                        | 1.1 to 1.3   | –                        | 6.3  | 12.3 | 1.0                                              | 14.4 |      |
|                          |                               |                                        | 1.4 to 1.6   | –                        | 4.4  | 8.1  | 1.0                                              | 9.4  |      |
|                          |                               |                                        | 1.65 to 1.95 | –                        | 3.6  | 6.2  | 0.5                                              | 6.7  |      |
|                          |                               |                                        | 2.3 to 2.7   | –                        | 2.6  | 3.9  | 0.5                                              | 4.4  |      |
|                          |                               |                                        | 3.0 to 3.6   | –                        | 2.1  | 3.1  | 0.5                                              | 3.7  |      |
|                          |                               | $C_L = 15$ pF,<br>$R_L = 1$ M $\Omega$ | 0.9          | –                        | 17.7 | –    | –                                                | –    | ns   |
|                          |                               |                                        | 1.1 to 1.3   | –                        | 7.1  | 13.6 | 1.0                                              | 15.6 |      |
|                          |                               |                                        | 1.4 to 1.6   | –                        | 5.0  | 9.2  | 1.0                                              | 10.4 |      |
|                          |                               |                                        | 1.65 to 1.95 | –                        | 4.1  | 6.9  | 1.0                                              | 7.1  |      |
|                          |                               |                                        | 2.3 to 2.7   | –                        | 2.9  | 4.4  | 0.5                                              | 5.0  |      |
|                          |                               |                                        | 3.0 to 3.6   | –                        | 2.4  | 3.4  | 0.5                                              | 3.9  |      |
|                          |                               | $C_L = 30$ pF,<br>$R_L = 1$ M $\Omega$ | 0.9          | –                        | 29   | –    | –                                                | –    | ns   |
|                          |                               |                                        | 1.1 to 1.3   | –                        | 9.3  | 17.3 | 1.0                                              | 21.2 |      |
|                          |                               |                                        | 1.4 to 1.6   | –                        | 6.4  | 11.6 | 1.0                                              | 12.6 |      |
|                          |                               |                                        | 1.65 to 1.95 | –                        | 5.3  | 9.1  | 1.0                                              | 9.6  |      |
|                          |                               |                                        | 2.3 to 2.7   | –                        | 4    | 5.7  | 1.0                                              | 6.1  |      |
|                          |                               |                                        | 3.0 to 3.6   | –                        | 3.3  | 4.4  | 1.0                                              | 4.8  |      |
| $t_{PLH}$ ,<br>$t_{PHL}$ | Propagation Delay,<br>LE to Q | $C_L = 10$ pF,<br>$R_L = 1$ M $\Omega$ | 0.9          | –                        | 15.3 | –    | –                                                | –    | ns   |
|                          |                               |                                        | 1.1 to 1.3   | –                        | 6.3  | 12.3 | 1.0                                              | 14.4 |      |
|                          |                               |                                        | 1.4 to 1.6   | –                        | 4.4  | 8.1  | 1.0                                              | 9.4  |      |
|                          |                               |                                        | 1.65 to 1.95 | –                        | 3.6  | 6.2  | 0.5                                              | 6.7  |      |
|                          |                               |                                        | 2.3 to 2.7   | –                        | 2.6  | 3.9  | 0.5                                              | 4.4  |      |
|                          |                               |                                        | 3.0 to 3.6   | –                        | 2.1  | 3.1  | 0.5                                              | 3.7  |      |
|                          |                               | $C_L = 15$ pF,<br>$R_L = 1$ M $\Omega$ | 0.9          | –                        | 17.7 | –    | –                                                | –    | ns   |
|                          |                               |                                        | 1.1 to 1.3   | –                        | 7.1  | 13.6 | 1.0                                              | 15.6 |      |
|                          |                               |                                        | 1.4 to 1.6   | –                        | 5.0  | 9.2  | 1.0                                              | 10.4 |      |
|                          |                               |                                        | 1.65 to 1.95 | –                        | 4.1  | 6.9  | 1.0                                              | 7.1  |      |
|                          |                               |                                        | 2.3 to 2.7   | –                        | 2.9  | 4.4  | 0.5                                              | 5.0  |      |
|                          |                               |                                        | 3.0 to 3.6   | –                        | 2.4  | 3.4  | 0.5                                              | 3.9  |      |
|                          |                               | $C_L = 30$ pF,<br>$R_L = 1$ M $\Omega$ | 0.9          | –                        | 29   | –    | –                                                | –    | ns   |
|                          |                               |                                        | 1.1 to 1.3   | –                        | 9.3  | 17.3 | 1.0                                              | 21.2 |      |
|                          |                               |                                        | 1.4 to 1.6   | –                        | 6.4  | 11.6 | 1.0                                              | 12.6 |      |
|                          |                               |                                        | 1.65 to 1.95 | –                        | 5.3  | 9.1  | 1.0                                              | 9.6  |      |
|                          |                               |                                        | 2.3 to 2.7   | –                        | 4    | 5.7  | 1.0                                              | 6.1  |      |
|                          |                               |                                        | 3.0 to 3.6   | –                        | 3.3  | 4.4  | 1.0                                              | 4.8  |      |

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## AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3.0$ ns)

| Symbol                   | Parameter                       | Test Condition                         | $V_{CC}$ (V) | $T_A = 25^\circ\text{C}$ |      |      | $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ |      | Unit |
|--------------------------|---------------------------------|----------------------------------------|--------------|--------------------------|------|------|--------------------------------------------------|------|------|
|                          |                                 |                                        |              | Min                      | Typ  | Max  | Min                                              | Max  |      |
| $t_{pZH}$ ,<br>$t_{pZL}$ | Output Enable<br>Time, OE to Q  | $C_L = 10$ pF,<br>$R_L = 5$ k $\Omega$ | 0.9          | –                        | 18.9 | –    | –                                                | –    | ns   |
|                          |                                 |                                        | 1.1 to 1.3   | –                        | 6.0  | 10.2 | 1                                                | 10.6 |      |
|                          |                                 |                                        | 1.4 to 1.6   | –                        | 4.5  | 6.5  | 1                                                | 7.0  |      |
|                          |                                 |                                        | 1.65 to 1.95 | –                        | 3.9  | 5.4  | 1                                                | 5.8  |      |
|                          |                                 |                                        | 2.3 to 2.7   | –                        | 2.5  | 3.5  | 1                                                | 3.8  |      |
|                          |                                 |                                        | 3.0 to 3.6   | –                        | 2.1  | 2.7  | 1                                                | 3    |      |
|                          |                                 | $C_L = 15$ pF,<br>$R_L = 5$ k $\Omega$ | 0.9          | –                        | 22   | –    | –                                                | –    | ns   |
|                          |                                 |                                        | 1.1 to 1.3   | –                        | 6.8  | 11.6 | 1                                                | 12.1 |      |
|                          |                                 |                                        | 1.4 to 1.6   | –                        | 5.1  | 7.2  | 1                                                | 7.9  |      |
|                          |                                 |                                        | 1.65 to 1.95 | –                        | 4.4  | 6.1  | 1                                                | 6.5  |      |
|                          |                                 |                                        | 2.3 to 2.7   | –                        | 2.9  | 3.9  | 1                                                | 4.2  |      |
|                          |                                 |                                        | 3.0 to 3.6   | –                        | 2.3  | 3    | 1                                                | 3.3  |      |
|                          |                                 | $C_L = 30$ pF,<br>$R_L = 5$ k $\Omega$ | 0.9          | –                        | 31.8 | –    | –                                                | –    | ns   |
|                          |                                 |                                        | 1.1 to 1.3   | –                        | 9.1  | 15.7 | 1                                                | 16.2 |      |
|                          |                                 |                                        | 1.4 to 1.6   | –                        | 6.7  | 9.5  | 1                                                | 10.5 |      |
|                          |                                 |                                        | 1.65 to 1.95 | –                        | 5.7  | 7.9  | 1                                                | 8.6  |      |
|                          |                                 |                                        | 2.3 to 2.7   | –                        | 3.8  | 5    | 1                                                | 5.5  |      |
|                          |                                 |                                        | 3.0 to 3.6   | –                        | 2.9  | 3.8  | 1                                                | 4.2  |      |
| $t_{pHZ}$ ,<br>$t_{pLZ}$ | Output Disable<br>Time, OE to Q | $C_L = 10$ pF,<br>$R_L = 5$ k $\Omega$ | 0.9          | –                        | 11.3 | –    | –                                                | –    | ns   |
|                          |                                 |                                        | 1.1 to 1.3   | –                        | 5.3  | 8.3  | 1                                                | 8.4  |      |
|                          |                                 |                                        | 1.4 to 1.6   | –                        | 4.1  | 5.8  | 1                                                | 6.1  |      |
|                          |                                 |                                        | 1.65 to 1.95 | –                        | 4.2  | 5.7  | 1                                                | 5.9  |      |
|                          |                                 |                                        | 2.3 to 2.7   | –                        | 3.0  | 4    | 1                                                | 4.2  |      |
|                          |                                 |                                        | 3.0 to 3.6   | –                        | 3.4  | 4.7  | 1                                                | 5    |      |
|                          |                                 | $C_L = 15$ pF,<br>$R_L = 5$ k $\Omega$ | 0.9          | –                        | 11   | –    | –                                                | –    | ns   |
|                          |                                 |                                        | 1.1 to 1.3   | –                        | 5.8  | 8.2  | 1                                                | 11   |      |
|                          |                                 |                                        | 1.4 to 1.6   | –                        | 3.9  | 5.9  | 1                                                | 8    |      |
|                          |                                 |                                        | 1.65 to 1.95 | –                        | 4.5  | 6.6  | 1                                                | 7.4  |      |
|                          |                                 |                                        | 2.3 to 2.7   | –                        | 3.2  | 4.3  | 1                                                | 5.1  |      |
|                          |                                 |                                        | 3.0 to 3.6   | –                        | 4.8  | 6.2  | 1                                                | 6.7  |      |
|                          |                                 | $C_L = 30$ pF,<br>$R_L = 5$ k $\Omega$ | 0.9          | –                        | 17.7 | –    | –                                                | –    | ns   |
|                          |                                 |                                        | 1.1 to 1.3   | –                        | 9.9  | 15.7 | 1                                                | 16   |      |
|                          |                                 |                                        | 1.4 to 1.6   | –                        | 7.7  | 10.8 | 1                                                | 11.6 |      |
|                          |                                 |                                        | 1.65 to 1.95 | –                        | 6    | 12.9 | 1                                                | 12.9 |      |
|                          |                                 |                                        | 2.3 to 2.7   | –                        | 5    | 9.1  | 1                                                | 9.5  |      |
|                          |                                 |                                        | 3.0 to 3.6   | –                        | 4    | 12.5 | 1                                                | 13   |      |

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## AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3.0$ ns)

| Symbol   | Parameter                              | Test Condition                                 | $V_{CC}$ (V) | $T_A = 25^\circ\text{C}$ |     |     | $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ |     | Unit |
|----------|----------------------------------------|------------------------------------------------|--------------|--------------------------|-----|-----|--------------------------------------------------|-----|------|
|          |                                        |                                                |              | Min                      | Typ | Max | Min                                              | Max |      |
| $C_{IN}$ | Input Capacitance                      |                                                | 0 to 3.6     |                          | 1.5 | –   | –                                                | –   | pF   |
| $C_O$    | Output Capacitance                     | $V_O = \text{GND}$                             | 0            |                          | 3   | –   | –                                                | –   | pF   |
| $C_{PD}$ | Power dissipation Capacitance (Note 5) | $f = 10$ MHz;<br>$V_I = \text{GND to } V_{CC}$ | 0.9          | –                        | 1.6 | –   |                                                  | –   | pF   |
|          |                                        |                                                | 1.1 to 1.3   | –                        | 1.7 | –   |                                                  | –   |      |
|          |                                        |                                                | 1.4 to 1.6   | –                        | 1.8 | –   |                                                  | –   |      |
|          |                                        |                                                | 1.65 to 1.95 | –                        | 1.9 | –   |                                                  | –   |      |
|          |                                        |                                                | 2.3 to 2.7   | –                        | 2.2 | –   |                                                  | –   |      |
|          |                                        |                                                | 3.0 to 3.6   | –                        | 2.7 | –   |                                                  | –   |      |

5.  $C_{PD}$  is defined as the value of the internal equivalent capacitance which is calculated from the dynamic operating current consumption without load. Average operating current can be obtained by the equation  $I_{CC(OPR)} = C_{PD} \cdot V_{CC} \cdot f_{in} + I_{CC}$ .  $C_{PD}$  is used to determine the no-load dynamic power consumption:  $P_D = C_{PD} \cdot V_{CC}^2 \cdot f_{in} + I_{CC} \cdot V_{CC}$ .

## TIMING REQUIREMENTS (Input $t_r = t_f = 3.0$ ns; $C_L = 5$ pF, 10 pF, 15 pF and 20 pF)

| Symbol   | Parameter            | Test Condition | $V_{CC}$ (V) | $T_A = 25^\circ\text{C}$ |      |     | $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ |     | Unit |
|----------|----------------------|----------------|--------------|--------------------------|------|-----|--------------------------------------------------|-----|------|
|          |                      |                |              | Min                      | Typ  | Max | Min                                              | Max |      |
| $t_W$    | Pulse Width, LE      | High           | 0.9          | –                        | 4.0  | –   | –                                                | –   | ns   |
|          |                      |                | 1.1 to 1.3   | –                        | 0.7  | –   | 2.1                                              | –   |      |
|          |                      |                | 1.4 to 1.6   | –                        | 0.5  | –   | 1.3                                              | –   |      |
|          |                      |                | 1.65 to 1.95 | –                        | 0.4  | –   | 1.0                                              | –   |      |
|          |                      |                | 2.3 to 2.7   | –                        | 0.3  | –   | 0.8                                              | –   |      |
|          |                      |                | 3.0 to 3.6   | –                        | 0.2  | –   | 0.8                                              | –   |      |
| $t_{SU}$ | Set-Up Time, D to LE | High or Low    | 0.9          | –                        | 2.1  | –   | –                                                | –   | ns   |
|          |                      |                | 1.1 to 1.3   | –                        | 0.5  | –   | 2.7                                              | –   |      |
|          |                      |                | 1.4 to 1.6   | –                        | 0.3  | –   | 1.5                                              | –   |      |
|          |                      |                | 1.65 to 1.95 | –                        | 0.3  | –   | 1.2                                              | –   |      |
|          |                      |                | 2.3 to 2.7   | –                        | 0.2  | –   | 0.9                                              | –   |      |
|          |                      |                | 3.0 to 3.6   | –                        | 0.2  | –   | 0.7                                              | –   |      |
| $t_H$    | Hold Time D to LE    | High or Low    | 0.9          | –                        | –2.8 | –   | –                                                | –   | ns   |
|          |                      |                | 1.1 to 1.3   | –                        | –0.7 | –   | –0.1                                             | –   |      |
|          |                      |                | 1.4 to 1.6   | –                        | –0.4 | –   | –0.1                                             | –   |      |
|          |                      |                | 1.65 to 1.95 | –                        | –0.4 | –   | 0                                                | –   |      |
|          |                      |                | 2.3 to 2.7   | –                        | –0.3 | –   | 0.2                                              | –   |      |
|          |                      |                | 3.0 to 3.6   | –                        | –0.4 | –   | 0.3                                              | –   |      |

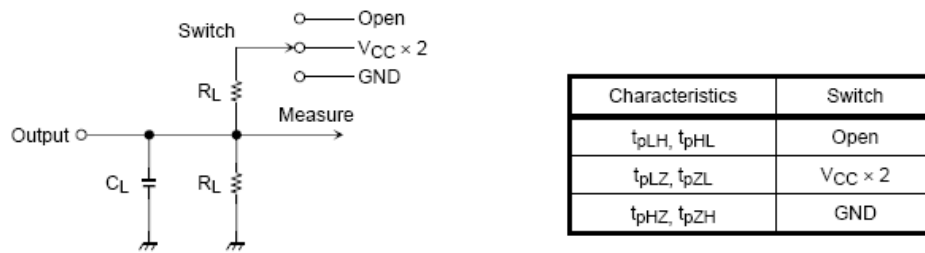
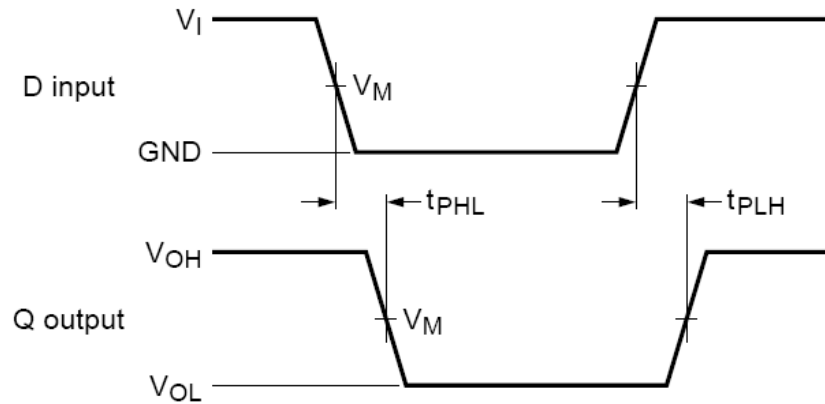
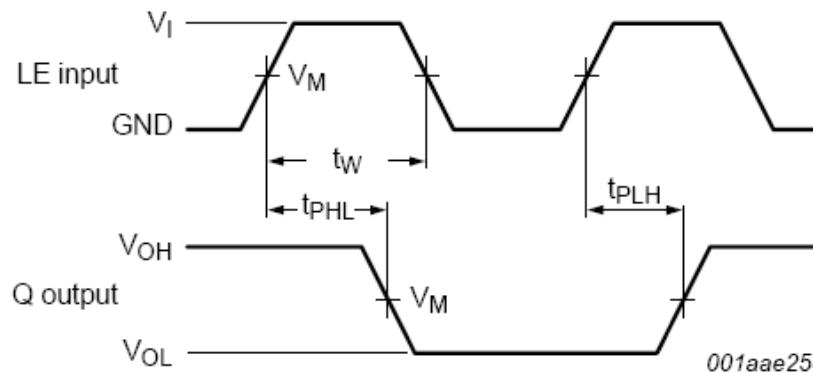


Figure 3. Test Circuit



Logic levels:  $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

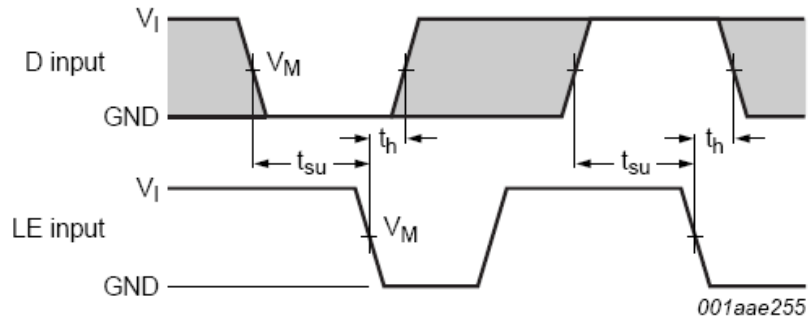
Figure 4.  $t_{PLH}$ ,  $t_{PHL}$  Waveforms (D to Q)



Logic levels:  $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

Figure 5.  $t_{PLH}$ ,  $t_{PHL}$ ,  $t_W$  Waveforms (LE to Q)

## NL17SG373

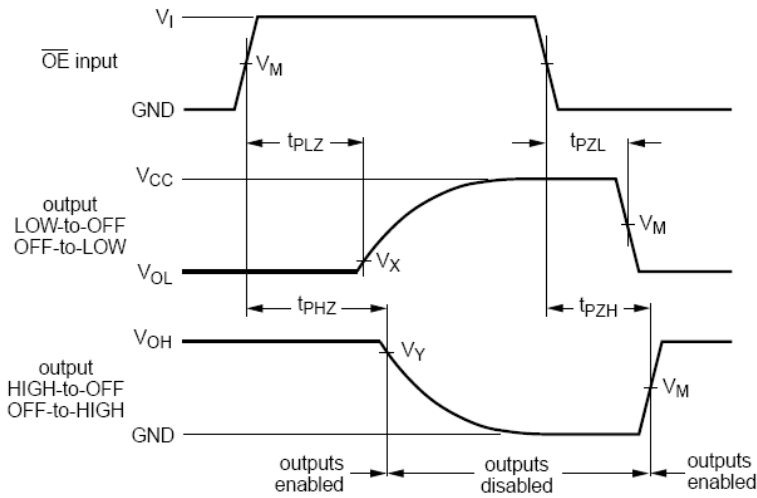


Logic levels:  $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

**Figure 6.  $t_{SU}$ ,  $t_H$  Waveforms (D to LE)**

### MEASUREMENT POINTS FOR FIGURES 4, 5 AND 6

| Supply Voltage | Input               |          |               | Output              |
|----------------|---------------------|----------|---------------|---------------------|
| $V_{CC}$       | $V_M$               | $V_I$    | $t_r = t_f$   | $V_M$               |
| 0.9 V to 3.6 V | $0.5 \times V_{CC}$ | $V_{CC}$ | $\leq 3.0$ ns | $0.5 \times V_{CC}$ |



Logic levels:  $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

**Figure 7.  $t_{PLZ}$ ,  $t_{PHZ}$ ,  $t_{PZH}$ ,  $t_{PZL}$  Waveforms ( $\overline{OE}$  to Q)**

### MEASUREMENT POINTS FOR FIGURE 7

| Supply Voltage   | Input               |          |               | Output              |                   |                   |
|------------------|---------------------|----------|---------------|---------------------|-------------------|-------------------|
| $V_{CC}$         | $V_M$               | $V_I$    | $t_r = t_f$   | $V_M$               | $V_X$             | $V_Y$             |
| 0.9 V            | $0.5 \times V_{CC}$ | $V_{CC}$ | $\leq 3.0$ ns | $0.5 \times V_{CC}$ | $V_{OL} + 0.1$ V  | $V_{OH} - 0.1$ V  |
| 1.1 V to 1.3 V   | $0.5 \times V_{CC}$ | $V_{CC}$ | $\leq 3.0$ ns | $0.5 \times V_{CC}$ | $V_{OL} + 0.1$ V  | $V_{OH} - 0.1$ V  |
| 1.4 V to 1.6 V   | $0.5 \times V_{CC}$ | $V_{CC}$ | $\leq 3.0$ ns | $0.5 \times V_{CC}$ | $V_{OL} + 0.1$ V  | $V_{OH} - 0.1$ V  |
| 1.65 V to 1.95 V | $0.5 \times V_{CC}$ | $V_{CC}$ | $\leq 3.0$ ns | $0.5 \times V_{CC}$ | $V_{OL} + 0.15$ V | $V_{OH} - 0.15$ V |
| 2.3 V to 2.7 V   | $0.5 \times V_{CC}$ | $V_{CC}$ | $\leq 3.0$ ns | $0.5 \times V_{CC}$ | $V_{OL} + 0.15$ V | $V_{OH} - 0.15$ V |
| 3.0 V to 3.6 V   | $0.5 \times V_{CC}$ | $V_{CC}$ | $\leq 3.0$ ns | $0.5 \times V_{CC}$ | $V_{OL} + 0.3$ V  | $V_{OH} - 0.3$ V  |



## NL17SG373

### ORDERING INFORMATION

| Device         | Package                                | Shipping†          |
|----------------|----------------------------------------|--------------------|
| NL17SG373DFT2G | SC-88 / SOT-363 / SC-70-6<br>(Pb-Free) | 3000 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

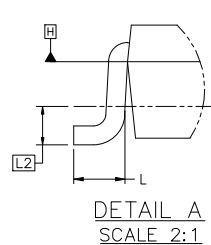
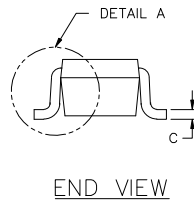
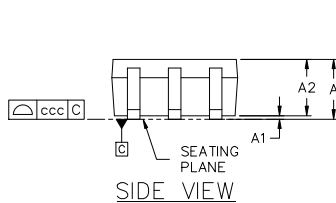
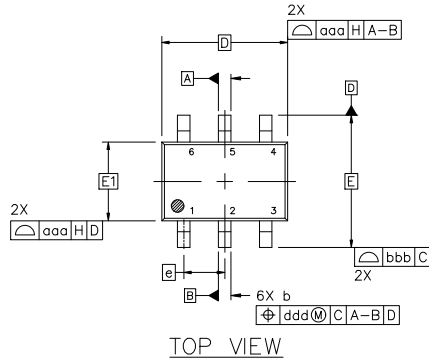
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THIS DEVICE IS NOT RECOMMENDED FOR NEW DESIGN  
PLEASE CONTACT YOUR onsemi  
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**SC-88 2.00x1.25x0.90, 0.65P**  
**CASE 419B-02**  
**ISSUE Z**

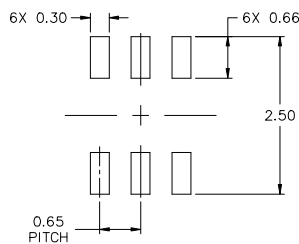
DATE 18 APR 2024

## NOTES:

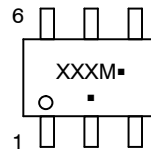
1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5-2018.
2. ALL DIMENSION ARE IN MILLIMETERS.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H.
5. DATUMS A AND B ARE DETERMINED AT DATUM H.
6. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.
7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION b AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.



| DIM | MILLIMETERS |      |      |
|-----|-------------|------|------|
|     | MIN.        | NOM. | MAX. |
| A   | ---         | ---  | 1.10 |
| A1  | 0.00        | ---  | 0.10 |
| A2  | 0.70        | 0.90 | 1.00 |
| b   | 0.15        | 0.20 | 0.25 |
| c   | 0.08        | 0.15 | 0.22 |
| D   | 2.00 BSC    |      |      |
| E   | 2.10 BSC    |      |      |
| E1  | 1.25 BSC    |      |      |
| e   | 0.65 BSC    |      |      |
| L   | 0.26        | 0.36 | 0.46 |
| L2  | 0.15 BSC    |      |      |
| aaa | 0.15        |      |      |
| bbb | 0.30        |      |      |
| ccc | 0.10        |      |      |
| ddd | 0.10        |      |      |



\* FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ONSEMI SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

**GENERIC MARKING DIAGRAM\***


XXX = Specific Device Code  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or position may vary depending upon manufacturing location.

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

**STYLES ON PAGE 2**

|                         |                                    |                                                                                                                                                                                  |
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SC-88 2.00x1.25x0.90, 0.65P  
CASE 419B-02  
ISSUE Z

DATE 18 APR 2024

|                                                                                                            |                                                                                                        |                                                                                                             |                                                                                                             |                                                                                                             |                                                                                                       |
|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| STYLE 1:<br>PIN 1. EMITTER 2<br>2. BASE 2<br>3. COLLECTOR 1<br>4. EMITTER 1<br>5. BASE 1<br>6. COLLECTOR 2 | STYLE 2:<br>CANCELLED                                                                                  | STYLE 3:<br>CANCELLED                                                                                       | STYLE 4:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. COLLECTOR<br>4. EMITTER<br>5. BASE<br>6. ANODE               | STYLE 5:<br>PIN 1. ANODE<br>2. ANODE<br>3. COLLECTOR<br>4. EMITTER<br>5. BASE<br>6. CATHODE                 | STYLE 6:<br>PIN 1. ANODE 2<br>2. N/C<br>3. CATHODE 1<br>4. ANODE 1<br>5. N/C<br>6. CATHODE 2          |
| STYLE 7:<br>PIN 1. SOURCE 2<br>2. DRAIN 2<br>3. GATE 1<br>4. SOURCE 1<br>5. DRAIN 1<br>6. GATE 2           | STYLE 8:<br>CANCELLED                                                                                  | STYLE 9:<br>PIN 1. EMITTER 2<br>2. EMITTER 1<br>3. COLLECTOR 1<br>4. BASE 1<br>5. BASE 2<br>6. COLLECTOR 2  | STYLE 10:<br>PIN 1. SOURCE 2<br>2. SOURCE 1<br>3. GATE 1<br>4. DRAIN 1<br>5. DRAIN 2<br>6. GATE 2           | STYLE 11:<br>PIN 1. CATHODE 2<br>2. CATHODE 2<br>3. ANODE 1<br>4. CATHODE 1<br>5. CATHODE 1<br>6. ANODE 2   | STYLE 12:<br>PIN 1. ANODE 2<br>2. ANODE 2<br>3. CATHODE 1<br>4. ANODE 1<br>5. ANODE 1<br>6. CATHODE 2 |
| STYLE 13:<br>PIN 1. ANODE<br>2. N/C<br>3. COLLECTOR<br>4. EMITTER<br>5. BASE<br>6. CATHODE                 | STYLE 14:<br>PIN 1. VREF<br>2. GND<br>3. GND<br>4. IOUT<br>5. VEN<br>6. VCC                            | STYLE 15:<br>PIN 1. ANODE 1<br>2. ANODE 2<br>3. ANODE 3<br>4. CATHODE 3<br>5. CATHODE 2<br>6. CATHODE 1     | STYLE 16:<br>PIN 1. BASE 1<br>2. EMITTER 2<br>3. COLLECTOR 2<br>4. BASE 2<br>5. EMITTER 1<br>6. COLLECTOR 1 | STYLE 17:<br>PIN 1. BASE 1<br>2. EMITTER 1<br>3. COLLECTOR 2<br>4. BASE 2<br>5. EMITTER 2<br>6. COLLECTOR 1 | STYLE 18:<br>PIN 1. VIN1<br>2. VCC<br>3. VOUT2<br>4. VIN2<br>5. GND<br>6. VOUT1                       |
| STYLE 19:<br>PIN 1. I OUT<br>2. GND<br>3. GND<br>4. V CC<br>5. V EN<br>6. V REF                            | STYLE 20:<br>PIN 1. COLLECTOR<br>2. COLLECTOR<br>3. BASE<br>4. EMITTER<br>5. COLLECTOR<br>6. COLLECTOR | STYLE 21:<br>PIN 1. ANODE 1<br>2. N/C<br>3. ANODE 2<br>4. CATHODE 2<br>5. N/C<br>6. CATHODE 1               | STYLE 22:<br>PIN 1. D1 (i)<br>2. GND<br>3. D2 (i)<br>4. D2 (c)<br>5. VBUS<br>6. D1 (c)                      | STYLE 23:<br>PIN 1. Vn<br>2. CH1<br>3. Vp<br>4. N/C<br>5. CH2<br>6. N/C                                     | STYLE 24:<br>PIN 1. CATHODE<br>2. ANODE<br>3. CATHODE<br>4. CATHODE<br>5. CATHODE<br>6. CATHODE       |
| STYLE 25:<br>PIN 1. BASE 1<br>2. CATHODE<br>3. COLLECTOR 2<br>4. BASE 2<br>5. EMITTER<br>6. COLLECTOR 1    | STYLE 26:<br>PIN 1. SOURCE 1<br>2. GATE 1<br>3. DRAIN 2<br>4. SOURCE 2<br>5. GATE 2<br>6. DRAIN 1      | STYLE 27:<br>PIN 1. BASE 2<br>2. BASE 1<br>3. COLLECTOR 1<br>4. EMITTER 1<br>5. EMITTER 2<br>6. COLLECTOR 2 | STYLE 28:<br>PIN 1. DRAIN<br>2. DRAIN<br>3. GATE<br>4. SOURCE<br>5. DRAIN<br>6. DRAIN                       | STYLE 29:<br>PIN 1. ANODE<br>2. ANODE<br>3. COLLECTOR<br>4. EMITTER<br>5. BASE/ANODE<br>6. CATHODE          | STYLE 30:<br>PIN 1. SOURCE 1<br>2. DRAIN 2<br>3. DRAIN 2<br>4. SOURCE 2<br>5. GATE 1<br>6. DRAIN 1    |

Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

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