



## 74VHC573

### OCTAL D-TYPE LATCH WITH 3 STATE OUTPUT NON INVERTING

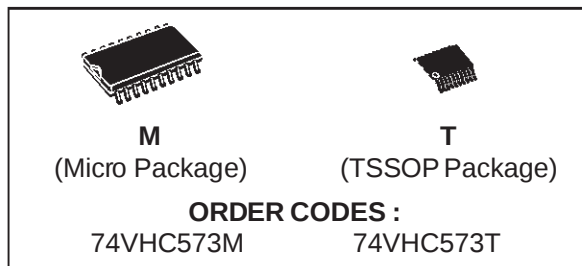
- HIGH SPEED:  $t_{PD} = 5.0 \text{ ns}$  (TYP.) at  $V_{CC} = 5V$
- LOW POWER DISSIPATION:  
 $I_{CC} = 4 \mu A$  (MAX.) at  $T_A = 25^\circ C$
- HIGH NOISE IMMUNITY:  
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (MIN.)
- POWER DOWN PROTECTION ON INPUTS
- SYMMETRICAL OUTPUT IMPEDANCE:  
 $|I_{OH}| = I_{OL} = 8 \text{ mA}$  (MIN)
- BALANCED PROPAGATION DELAYS:  
 $t_{PLH} \cong t_{PHL}$
- OPERATING VOLTAGE RANGE:  
 $V_{CC}$  (OPR) = 2V to 5.5V
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 573
- IMPROVED LATCH-UP IMMUNITY
- LOW NOISE:  $V_{OLP} = 0.9V$  (Max.)

#### DESCRIPTION

The 74VHC573 is an advanced high-speed CMOS OCTAL D-TYPE LATCH with 3 STATE OUTPUT NON INVERTING fabricated with sub-micron silicon gate and double-layer metal wiring C<sup>2</sup>MOS technology.

This 8 bit D-Type latch is controlled by a latch enable input (LE) and an output enable input ( $\overline{OE}$ ).

While the LE input is held at a high level, the Q



outputs will follow the data inputs precisely.

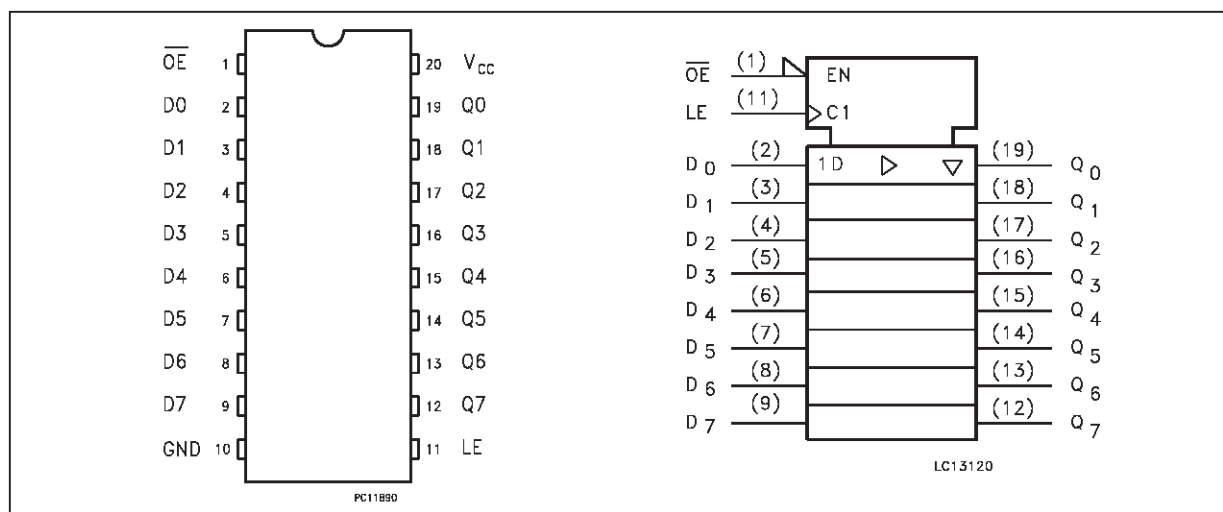
When the LE is taken low, the Q outputs will be latched precisely at the logic level of D input data.

While the ( $\overline{OE}$ ) input is low, the 8 outputs will be in a normal logic state (high or low logic level) and while high level the outputs will be in a high impedance state.

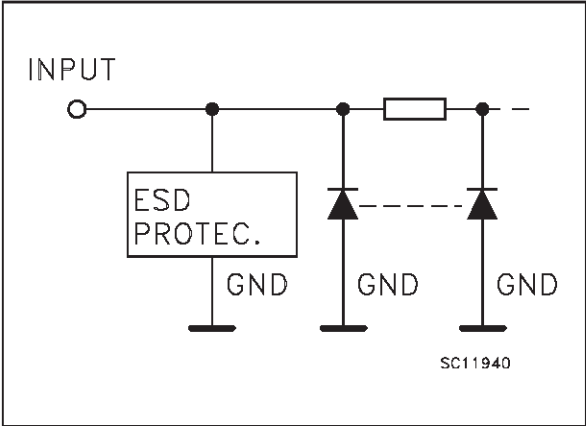
Power down protection is provided on all inputs and 0 to 7V can be accepted on inputs with no regard to the supply voltage. This device can be used to interface 5V to 3V.

All inputs and outputs are equipped with protection circuits against static discharge, giving them 2KV ESD immunity and transient excess voltage.

#### PIN CONNECTION AND IEC LOGIC SYMBOLS



INPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

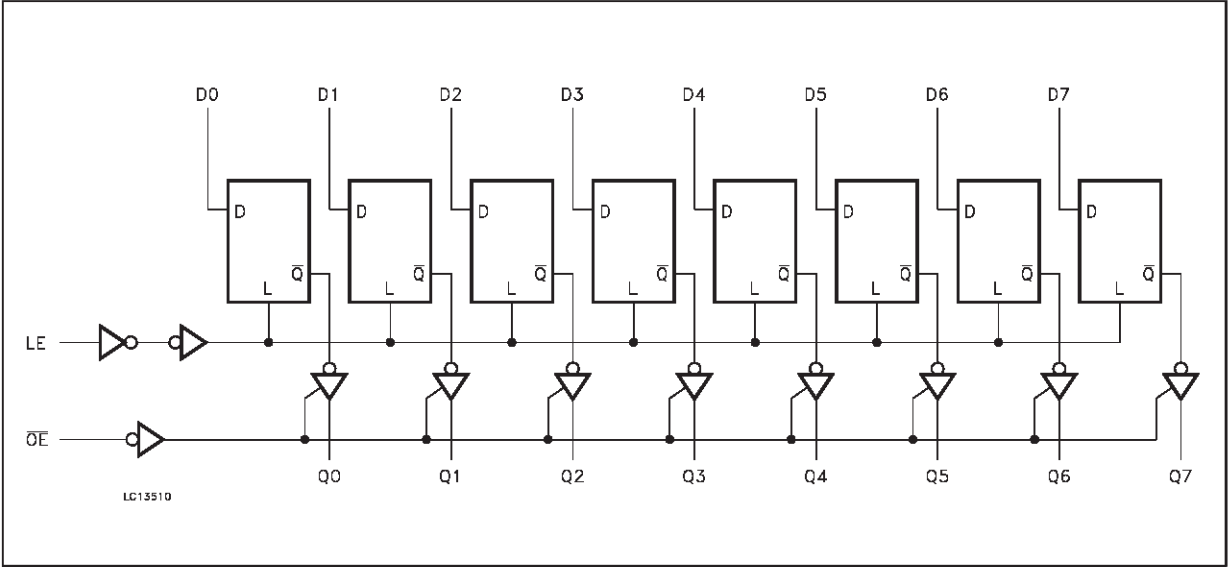
| PIN No                         | SYMBOL          | NAME AND FUNCTION                        |
|--------------------------------|-----------------|------------------------------------------|
| 1                              | $\overline{OE}$ | 3 State Output Enable Input (Active LOW) |
| 2, 3, 4, 5, 6, 7, 8, 9         | D0 to D7        | Data Inputs                              |
| 12, 13, 14, 15, 16, 17, 18, 19 | Q0 to Q7        | 3 State Latch Outputs                    |
| 11                             | LE              | Latch Enable Input                       |
| 10                             | GND             | Ground (0V)                              |
| 20                             | V <sub>CC</sub> | Positive Supply Voltage                  |

TRUTH TABLE

| INPUTS          |    |   | OUTPUTS     |
|-----------------|----|---|-------------|
| $\overline{OE}$ | LE | D | Q           |
| H               | X  | X | Z           |
| L               | L  | X | NO CHANGE * |
| L               | H  | L | L           |
| L               | H  | H | H           |

X: Don't care  
Z: High impedance  
\* Q outputs are latched at the time when the LE input is taken low logic level.

LOGIC DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

| Symbol                | Parameter                     | Value                  | Unit |
|-----------------------|-------------------------------|------------------------|------|
| $V_{CC}$              | Supply Voltage                | -0.5 to +7.0           | V    |
| $V_I$                 | DC Input Voltage              | -0.5 to +7.0           | V    |
| $V_O$                 | DC Output Voltage             | -0.5 to $V_{CC} + 0.5$ | V    |
| $I_{IK}$              | DC Input Diode Current        | - 20                   | mA   |
| $I_{OK}$              | DC Output Diode Current       | $\pm 20$               | mA   |
| $I_O$                 | DC Output Current             | $\pm 25$               | mA   |
| $I_{CC}$ or $I_{GND}$ | DC $V_{CC}$ or Ground Current | $\pm 75$               | mA   |
| $T_{stg}$             | Storage Temperature           | -65 to +150            | °C   |
| $T_L$                 | Lead Temperature (10 sec)     | 300                    | °C   |

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

## RECOMMENDED OPERATING CONDITIONS

| Symbol   | Parameter                                                                                        | Value               | Unit         |
|----------|--------------------------------------------------------------------------------------------------|---------------------|--------------|
| $V_{CC}$ | Supply Voltage                                                                                   | 2.0 to 5.5          | V            |
| $V_I$    | Input Voltage                                                                                    | 0 to 5.5            | V            |
| $V_O$    | Output Voltage                                                                                   | 0 to $V_{CC}$       | V            |
| $T_{op}$ | Operating Temperature                                                                            | -40 to +85          | °C           |
| dt/dv    | Input Rise and Fall Time (see note 1) ( $V_{CC} = 3.3 \pm 0.3V$ )<br>( $V_{CC} = 5.0 \pm 0.5V$ ) | 0 to 100<br>0 to 20 | ns/V<br>ns/V |

1)  $V_{IN}$  from 30% to 70% of  $V_{CC}$

## DC SPECIFICATIONS

| Symbol          | Parameter                             | Test Conditions        |                                                                                                | Value                  |      |                    |                    |                    | Unit |
|-----------------|---------------------------------------|------------------------|------------------------------------------------------------------------------------------------|------------------------|------|--------------------|--------------------|--------------------|------|
|                 |                                       | V <sub>CC</sub><br>(V) |                                                                                                | T <sub>A</sub> = 25 °C |      |                    | -40 to 85 °C       |                    |      |
|                 |                                       |                        |                                                                                                | Min.                   | Typ. | Max.               | Min.               | Max.               |      |
| V <sub>IH</sub> | High Level Input Voltage              | 2.0                    |                                                                                                | 1.5                    |      |                    | 1.5                |                    | V    |
|                 |                                       | 3.0 to 5.5             |                                                                                                | 0.7V <sub>CC</sub>     |      |                    | 0.7V <sub>CC</sub> |                    |      |
| V <sub>IL</sub> | Low Level Input Voltage               | 2.0                    |                                                                                                |                        |      | 0.5                |                    | 0.5                | V    |
|                 |                                       | 3.0 to 5.5             |                                                                                                |                        |      | 0.3V <sub>CC</sub> |                    | 0.3V <sub>CC</sub> |      |
| V <sub>OH</sub> | High Level Output Voltage             | 2.0                    | I <sub>O</sub> =-50 μA                                                                         | 1.9                    | 2.0  |                    | 1.9                |                    | V    |
|                 |                                       | 3.0                    | I <sub>O</sub> =-50 μA                                                                         | 2.9                    | 3.0  |                    | 2.9                |                    |      |
|                 |                                       | 4.5                    | I <sub>O</sub> =-50 μA                                                                         | 4.4                    | 4.5  |                    | 4.4                |                    |      |
|                 |                                       | 3.0                    | I <sub>O</sub> =-4 mA                                                                          | 2.58                   |      |                    | 2.48               |                    |      |
|                 |                                       | 4.5                    | I <sub>O</sub> =-8 mA                                                                          | 3.94                   |      |                    | 3.8                |                    |      |
| V <sub>OL</sub> | Low Level Output Voltage              | 2.0                    | I <sub>O</sub> =50 μA                                                                          |                        | 0.0  | 0.1                |                    | 0.1                | V    |
|                 |                                       | 3.0                    | I <sub>O</sub> =50 μA                                                                          |                        | 0.0  | 0.1                |                    | 0.1                |      |
|                 |                                       | 4.5                    | I <sub>O</sub> =50 μA                                                                          |                        | 0.0  | 0.1                |                    | 0.1                |      |
|                 |                                       | 3.0                    | I <sub>O</sub> =4 mA                                                                           |                        |      | 0.36               |                    | 0.44               |      |
|                 |                                       | 4.5                    | I <sub>O</sub> =8 mA                                                                           |                        |      | 0.36               |                    | 0.44               |      |
| I <sub>OZ</sub> | High Impedance Output Leakage Current | 5.5                    | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>V <sub>O</sub> = V <sub>CC</sub> or GND |                        |      | ±0.25              |                    | ±2.5               | μA   |
| I <sub>I</sub>  | Input Leakage Current                 | 0 to 5.5               | V <sub>I</sub> = 5.5V or GND                                                                   |                        |      | ±0.1               |                    | ±1.0               | μA   |
| I <sub>CC</sub> | Quiescent Supply Current              | 5.5                    | V <sub>I</sub> = V <sub>CC</sub> or GND                                                        |                        |      | 4                  |                    | 40                 | μA   |

AC ELECTRICAL CHARACTERISTICS (Input  $t_r = t_f = 3$  ns)

| Symbol                                 | Parameter                           | Test Condition         |                        |                      | Value                  |      |      |              |      | Unit |
|----------------------------------------|-------------------------------------|------------------------|------------------------|----------------------|------------------------|------|------|--------------|------|------|
|                                        |                                     | V <sub>CC</sub><br>(V) | C <sub>L</sub><br>(pF) |                      | T <sub>A</sub> = 25 °C |      |      | -40 to 85 °C |      |      |
|                                        |                                     |                        |                        |                      | Min.                   | Typ. | Max. | Min.         | Max. |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub>   | Propagation Delay Time (LE to Q)    | 3.3 <sup>(*)</sup>     | 15                     |                      |                        | 7.6  | 11.9 | 1.0          | 14.0 | ns   |
|                                        |                                     | 3.3 <sup>(*)</sup>     | 50                     |                      |                        | 10.1 | 15.4 | 1.0          | 17.5 |      |
|                                        |                                     | 5.0 <sup>(**)</sup>    | 15                     |                      |                        | 5.0  | 7.7  | 1.0          | 9.0  |      |
|                                        |                                     | 5.0 <sup>(**)</sup>    | 50                     |                      |                        | 6.5  | 9.7  | 1.0          | 11.0 |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub>   | Propagation Delay Time (D to Q)     | 3.3 <sup>(*)</sup>     | 15                     |                      |                        | 7.0  | 11.0 | 1.0          | 13.0 | ns   |
|                                        |                                     | 3.3 <sup>(*)</sup>     | 50                     |                      |                        | 9.5  | 14.5 | 1.0          | 16.5 |      |
|                                        |                                     | 5.0 <sup>(**)</sup>    | 15                     |                      |                        | 4.5  | 6.8  | 1.0          | 8.0  |      |
|                                        |                                     | 5.0 <sup>(**)</sup>    | 50                     |                      |                        | 6.0  | 8.8  | 1.0          | 10.0 |      |
| t <sub>PZL</sub><br>t <sub>PZH</sub>   | Output EnableTime                   | 3.3 <sup>(*)</sup>     | 15                     | R <sub>L</sub> = 1KΩ |                        | 7.3  | 11.5 | 1.0          | 13.5 | ns   |
|                                        |                                     | 3.3 <sup>(*)</sup>     | 50                     | R <sub>L</sub> = 1KΩ |                        | 9.8  | 15.0 | 1.0          | 17.0 |      |
|                                        |                                     | 5.0 <sup>(**)</sup>    | 15                     | R <sub>L</sub> = 1KΩ |                        | 5.2  | 7.7  | 1.0          | 9.0  |      |
|                                        |                                     | 5.0 <sup>(**)</sup>    | 50                     | R <sub>L</sub> = 1KΩ |                        | 6.7  | 9.7  | 1.0          | 11.0 |      |
| t <sub>PLZ</sub><br>t <sub>PHZ</sub>   | Output Disable Time                 | 3.3 <sup>(*)</sup>     | 50                     | R <sub>L</sub> = 1KΩ |                        | 10.7 | 14.5 | 1.0          | 16.5 | ns   |
|                                        |                                     | 5.0 <sup>(**)</sup>    | 50                     | R <sub>L</sub> = 1KΩ |                        | 6.7  | 9.7  | 1.0          | 11   |      |
| t <sub>w</sub>                         | Pulse Width (LE) HIGH               | 3.3 <sup>(*)</sup>     |                        |                      |                        |      | 5.0  |              | 5.0  | ns   |
|                                        |                                     | 5.0 <sup>(**)</sup>    |                        |                      |                        |      | 5.0  |              | 5.0  |      |
| t <sub>s</sub>                         | Setup Time D to LE HIGH or LOW      | 3.3 <sup>(*)</sup>     |                        |                      |                        |      | 3.5  |              | 3.5  | ns   |
|                                        |                                     | 5.0 <sup>(**)</sup>    |                        |                      |                        |      | 3.5  |              | 3.5  |      |
| t <sub>h</sub>                         | Hold Time D to LE HIGH or LOW       | 3.3 <sup>(*)</sup>     |                        |                      |                        |      | 1.5  |              | 1.5  | ns   |
|                                        |                                     | 5.0 <sup>(**)</sup>    |                        |                      |                        |      | 1.5  |              | 1.5  |      |
| t <sub>OSLH</sub><br>t <sub>OSHL</sub> | Output to Output Skew Time (note 1) | 3.3 <sup>(*)</sup>     | 50                     |                      |                        |      | 1.5  |              | 1.5  | ns   |
|                                        |                                     | 5.0 <sup>(**)</sup>    | 50                     |                      |                        |      | 1.0  |              | 1.0  |      |

(\*) Voltage range is  $3.3\text{V} \pm 0.3\text{V}$ (\*\*) Voltage range is  $5\text{V} \pm 0.5\text{V}$ Note 1: Parameter guaranteed by design.  $t_{soLH} = |t_{pLHm} - t_{pLHr}|$ ,  $t_{soHL} = |t_{pHLm} - t_{pHLr}|$ 

## CAPACITIVE CHARACTERISTICS

| Symbol           | Parameter                              | Test Conditions | Value                  |      |      |              |      | Unit |
|------------------|----------------------------------------|-----------------|------------------------|------|------|--------------|------|------|
|                  |                                        |                 | T <sub>A</sub> = 25 °C |      |      | -40 to 85 °C |      |      |
|                  |                                        |                 | Min.                   | Typ. | Max. | Min.         | Max. |      |
| C <sub>IN</sub>  | Input Capacitance                      |                 |                        | 4    | 10   |              | 10   | pF   |
| C <sub>OUT</sub> | Output Capacitance                     |                 |                        | 6    |      |              |      | pF   |
| C <sub>PD</sub>  | Power Dissipation Capacitance (note 1) |                 |                        | 29   |      |              |      | pF   |

1)  $C_{PD}$  is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation.  $I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC0}$  (per Latch)

## DYNAMIC SWITCHING CHARACTERISTICS

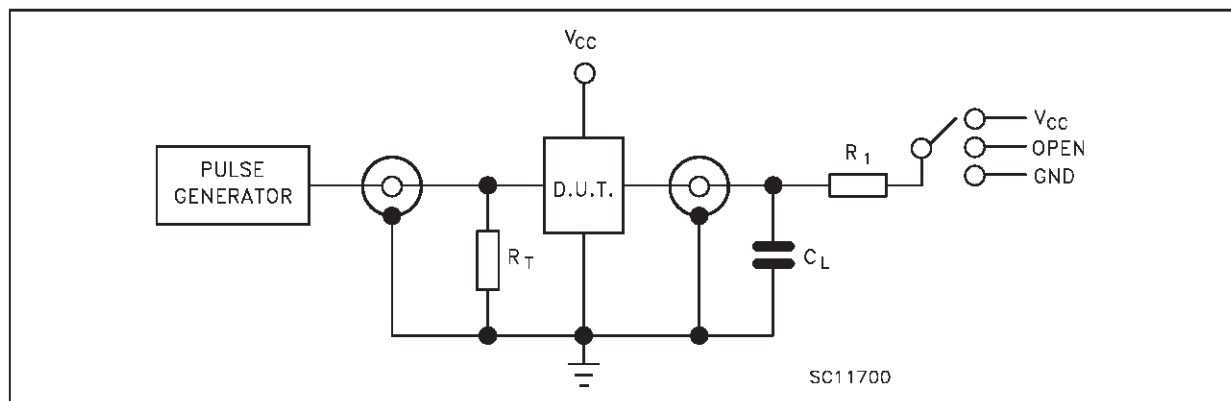
| Symbol           | Parameter                              | Test Conditions        |                        | Value                  |      |      |              |      | Unit |
|------------------|----------------------------------------|------------------------|------------------------|------------------------|------|------|--------------|------|------|
|                  |                                        | V <sub>CC</sub><br>(V) |                        | T <sub>A</sub> = 25 °C |      |      | -40 to 85 °C |      |      |
|                  |                                        |                        |                        | Min.                   | Typ. | Max. | Min.         | Max. |      |
| V <sub>OLP</sub> | Dynamic Low Voltage                    | 5.0                    | C <sub>L</sub> = 50 pF |                        | 0.6  | 0.9  |              |      | V    |
| V <sub>OLV</sub> | Quiet Output (note 1, 2)               |                        |                        | -0.9                   | -0.6 |      |              |      |      |
| V <sub>IHD</sub> | Dynamic High Voltage Input (note 1, 3) | 5.0                    |                        | 3.5                    |      |      |              |      |      |
| V <sub>ILD</sub> | Dynamic Low Voltage Input (note 1, 3)  | 5.0                    |                        |                        |      | 1.5  |              |      |      |

1) Worst case package.

2) Max number of outputs defined as (n). Data inputs are driven 0V to 5.0V, (n-1) outputs switching and one output at GND.

3) Max number of data inputs (n) switching. (n-1) switching 0V to 5.0V. Inputs under test switching: 5.0V to threshold (V<sub>ILD</sub>), 0V to threshold (V<sub>IHD</sub>), f=1MHz.

## TEST CIRCUIT



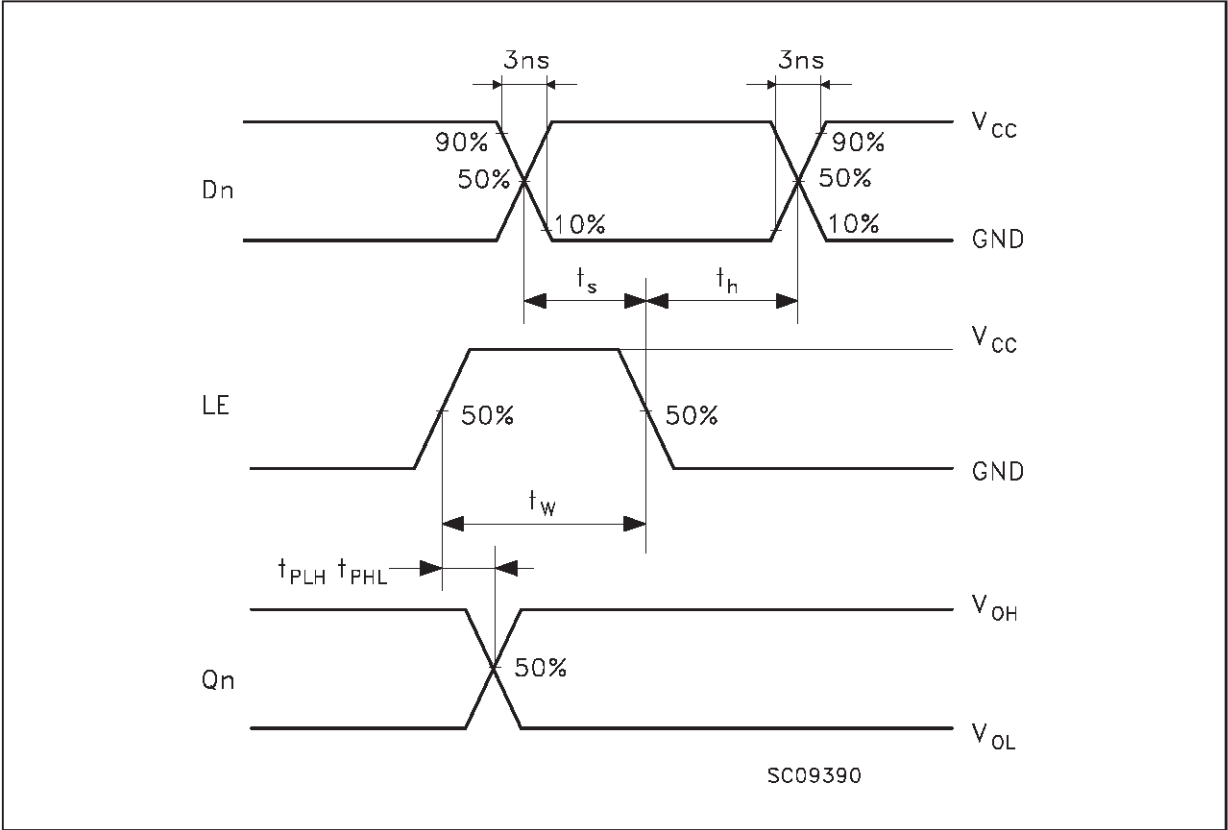
| TEST                                | SWITCH          |
|-------------------------------------|-----------------|
| t <sub>PLH</sub> , t <sub>PHL</sub> | Open            |
| t <sub>PZL</sub> , t <sub>PLZ</sub> | V <sub>CC</sub> |
| t <sub>PZH</sub> , t <sub>PHZ</sub> | GND             |

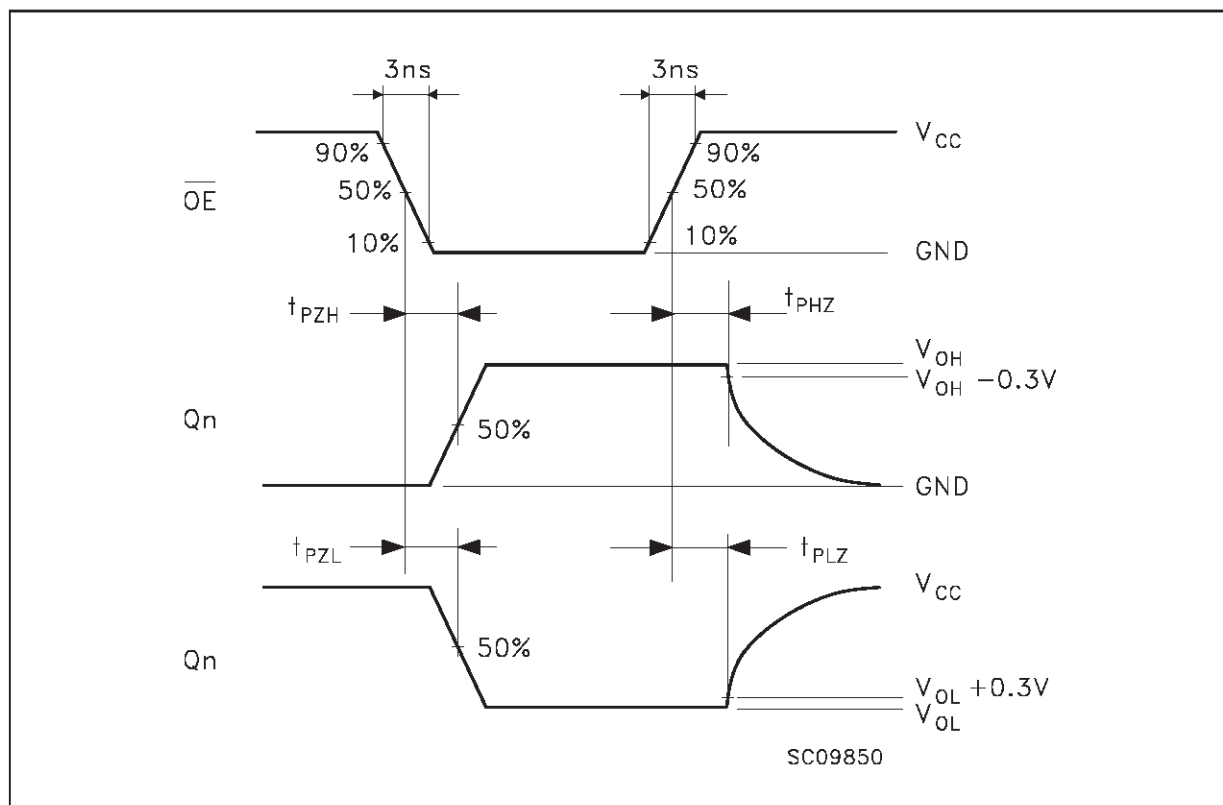
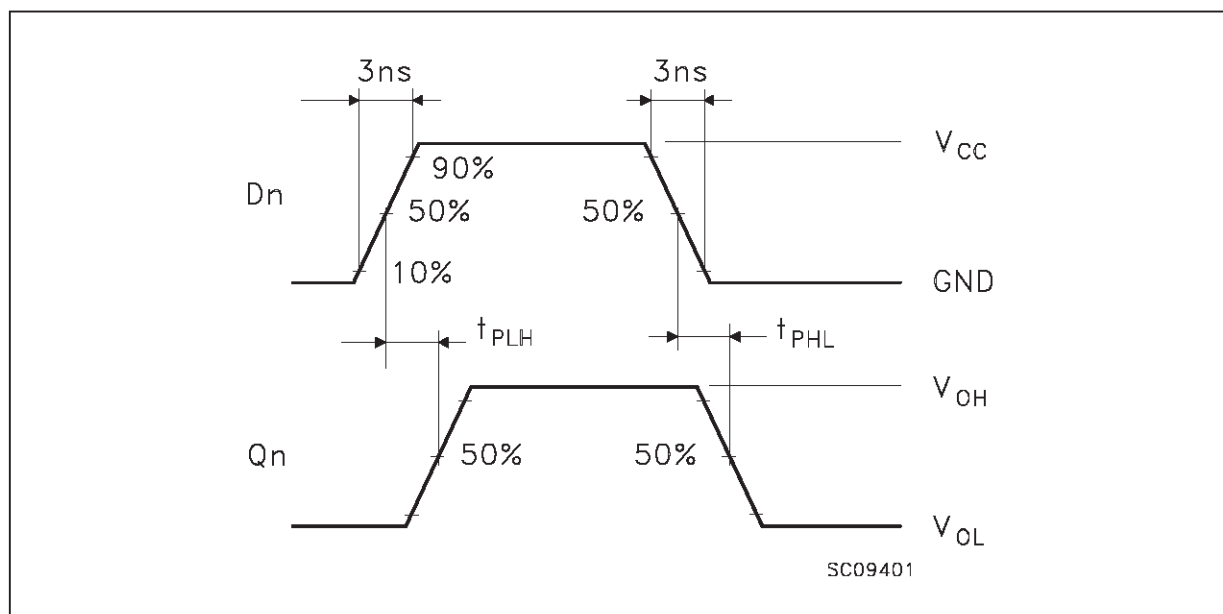
C<sub>L</sub> = 15/50 pF or equivalent (includes jig and probe capacitance)

R<sub>L</sub> = R<sub>1</sub> = 1KΩ or equivalent

R<sub>T</sub> = Z<sub>OUT</sub> of pulse generator (typically 50Ω)

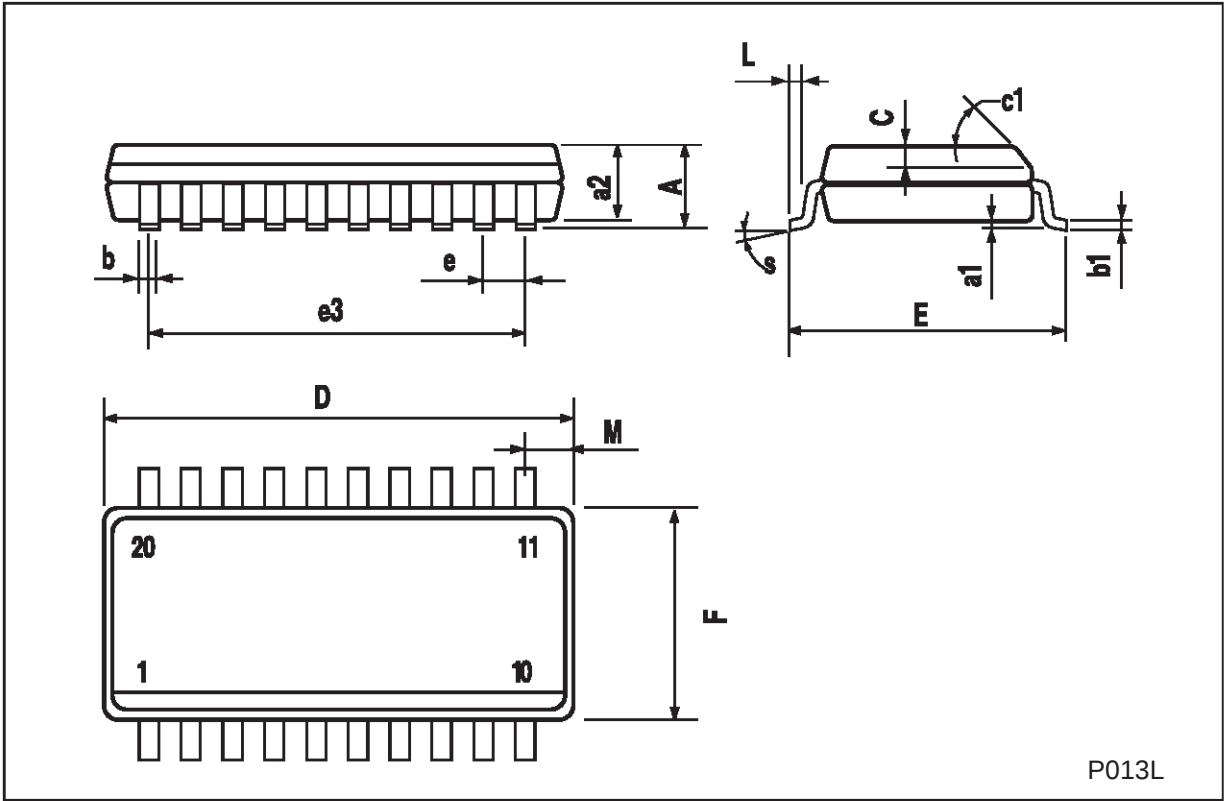
WAVEFORM 1: LE TO Qn PROPAGATION DELAYS, LE MINIMUM PULSE WIDTH, Dn TO LE SETUP AND HOLD TIMES (f=1MHz; 50% duty cycle)



**WAVEFORM 2: OUTPUT ENABLE AND DISABLE TIMES** ( $f=1\text{MHz}$ ; 50% duty cycle)**WAVEFORM 3: PROPAGATION DELAY TIME** ( $f=1\text{MHz}$ ; 50% duty cycle)

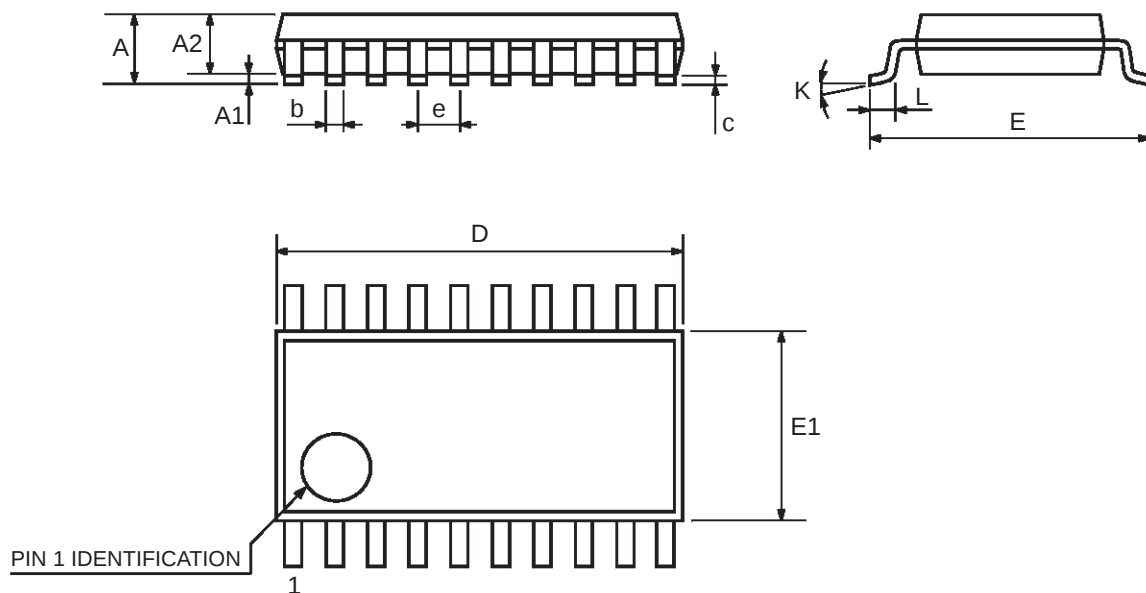
SO-20 MECHANICAL DATA

| DIM. | mm        |       |       | inch  |       |       |
|------|-----------|-------|-------|-------|-------|-------|
|      | MIN.      | TYP.  | MAX.  | MIN.  | TYP.  | MAX.  |
| A    |           |       | 2.65  |       |       | 0.104 |
| a1   | 0.10      |       | 0.20  | 0.004 |       | 0.007 |
| a2   |           |       | 2.45  |       |       | 0.096 |
| b    | 0.35      |       | 0.49  | 0.013 |       | 0.019 |
| b1   | 0.23      |       | 0.32  | 0.009 |       | 0.012 |
| C    |           | 0.50  |       |       | 0.020 |       |
| c1   | 45 (typ.) |       |       |       |       |       |
| D    | 12.60     |       | 13.00 | 0.496 |       | 0.512 |
| E    | 10.00     |       | 10.65 | 0.393 |       | 0.419 |
| e    |           | 1.27  |       |       | 0.050 |       |
| e3   |           | 11.43 |       |       | 0.450 |       |
| F    | 7.40      |       | 7.60  | 0.291 |       | 0.299 |
| L    | 0.50      |       | 1.27  | 0.19  |       | 0.050 |
| M    |           |       | 0.75  |       |       | 0.029 |
| S    | 8 (max.)  |       |       |       |       |       |



## TSSOP20 MECHANICAL DATA

| DIM. | mm   |          |      | inch   |            |        |
|------|------|----------|------|--------|------------|--------|
|      | MIN. | TYP.     | MAX. | MIN.   | TYP.       | MAX.   |
| A    |      |          | 1.1  |        |            | 0.433  |
| A1   | 0.05 | 0.10     | 0.15 | 0.002  | 0.004      | 0.006  |
| A2   | 0.85 | 0.9      | 0.95 | 0.335  | 0.354      | 0.374  |
| b    | 0.19 |          | 0.30 | 0.0075 |            | 0.0118 |
| c    | 0.09 |          | 0.2  | 0.0035 |            | 0.0079 |
| D    | 6.4  | 6.5      | 6.6  | 0.252  | 0.256      | 0.260  |
| E    | 6.25 | 6.4      | 6.5  | 0.246  | 0.252      | 0.256  |
| E1   | 4.3  | 4.4      | 4.48 | 0.169  | 0.173      | 0.176  |
| e    |      | 0.65 BSC |      |        | 0.0256 BSC |        |
| K    | 0°   | 4°       | 8°   | 0°     | 4°         | 8°     |
| L    | 0.50 | 0.60     | 0.70 | 0.020  | 0.024      | 0.028  |



Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specification mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a trademark of STMicroelectronics

© 1999 STMicroelectronics – Printed in Italy – All Rights Reserved

STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - Canada - China - France - Germany - Italy - Japan - Korea - Malaysia - Malta - Mexico - Morocco - The Netherlands -  
Singapore - Spain - Sweden - Switzerland - Taiwan - Thailand - United Kingdom - U.S.A.

<http://www.st.com>